WORK

An Illustrated Magazine of Practice and Theory

FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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VOL. II.—No. 74.] SATURDAY, AUGUST 16, 1890. [PRICE ONE PENNY.

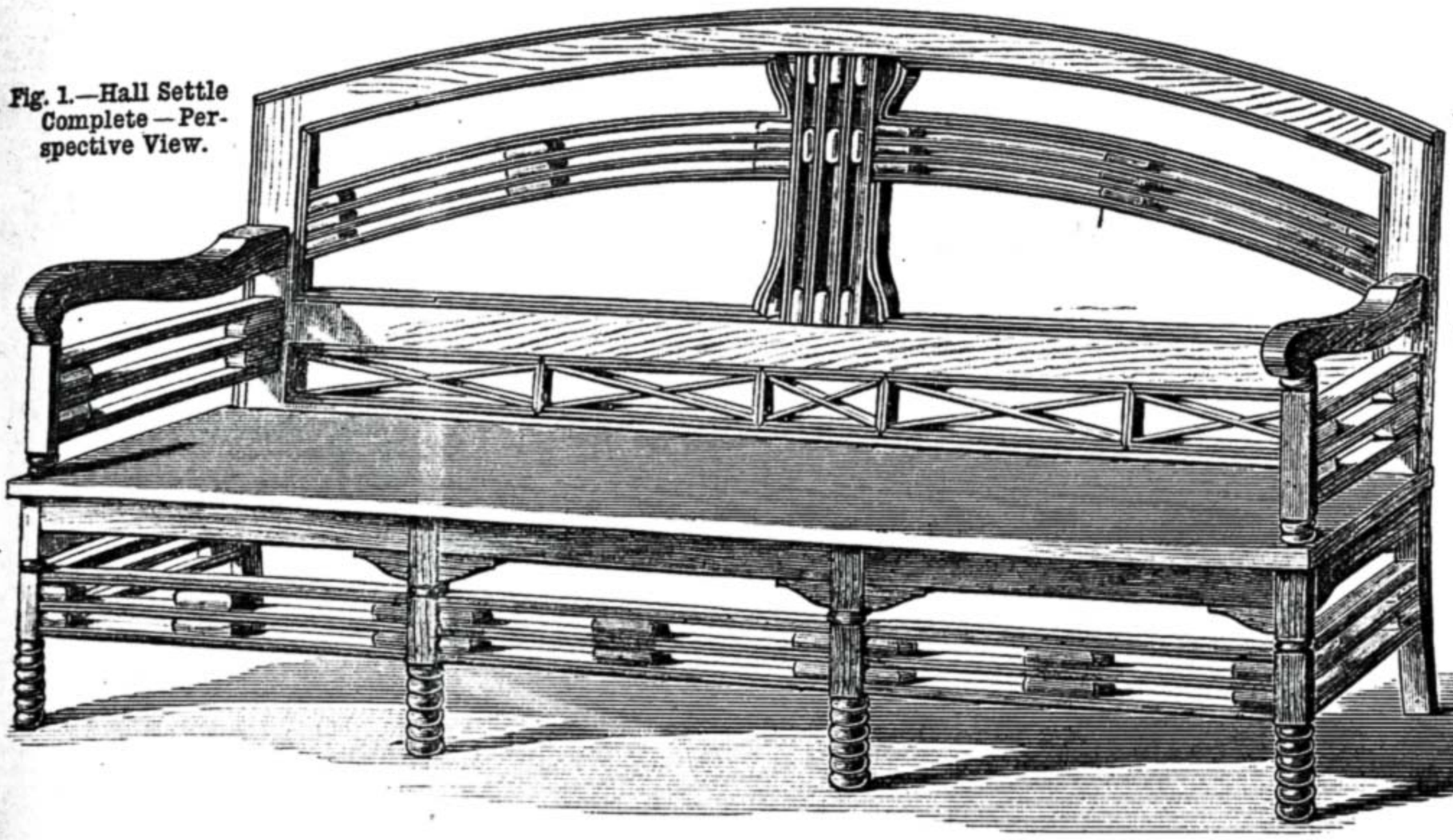


Fig. 1.—Hall Settle Complete—Perspective View.

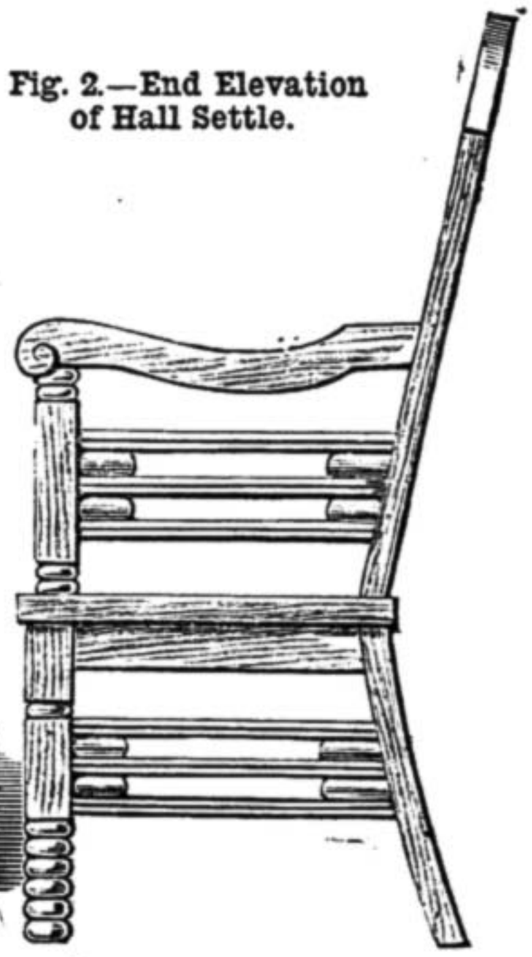


Fig. 2.—End Elevation of Hall Settle.

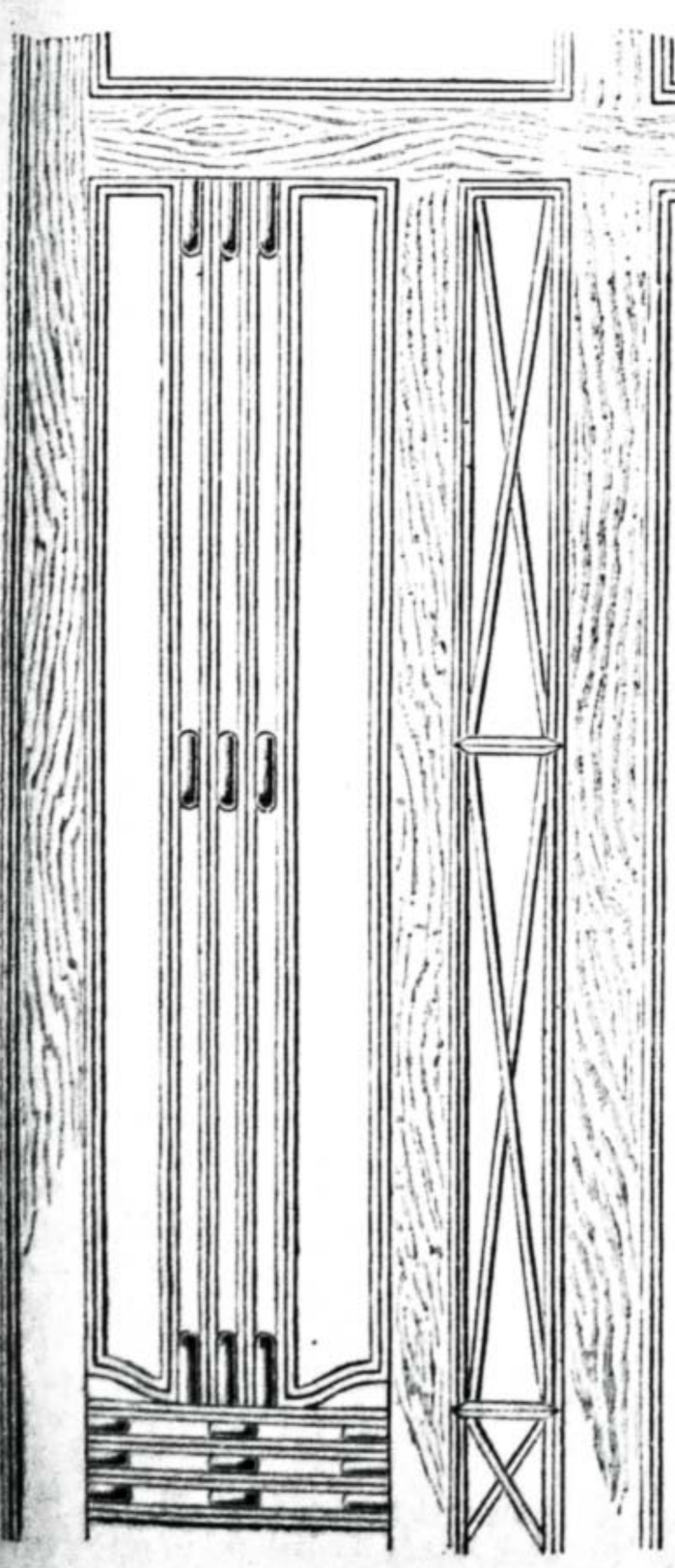


Fig. 3.—Half of Tailboard of Old Bedstead.

Fig. 7.—Upright of Arm.

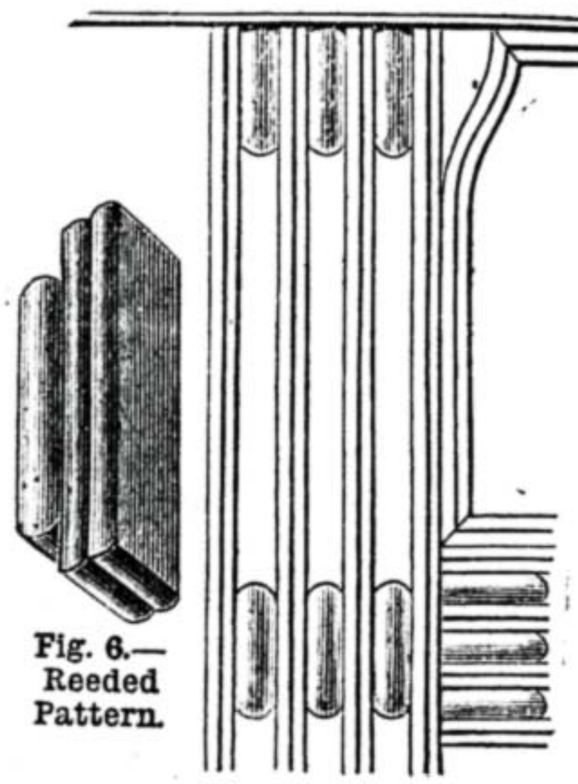
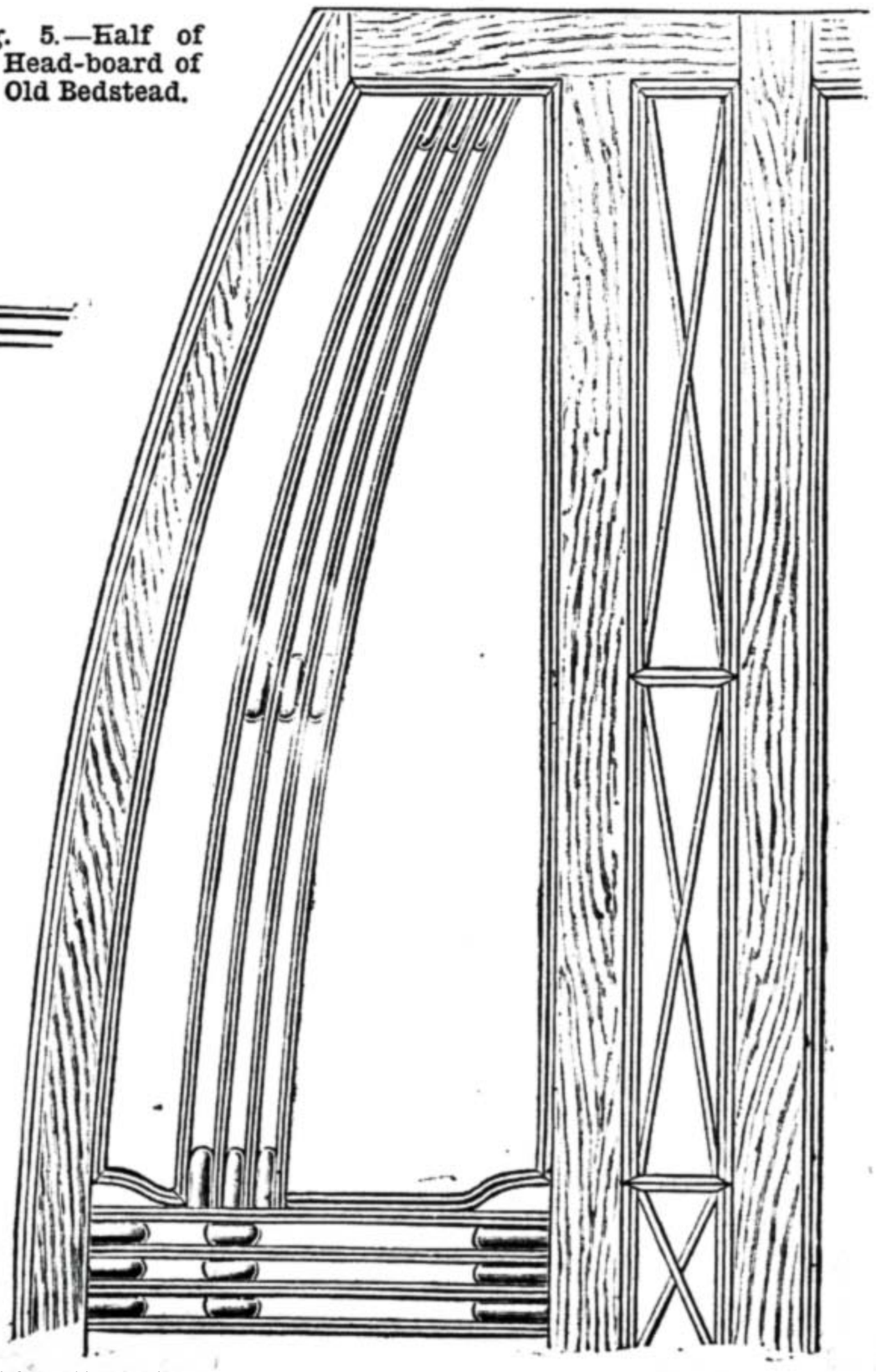


Fig. 6.—Reeded Pattern.

Fig. 4.—Detail of Ornament.

Fig. 5.—Half of Head-board of Old Bedstead.



A HALL SETTLE.

FROM AN

OLD BEDSTEAD

OF THE

SHERATON PERIOD.

BY

E. BONNEY STEYNE.

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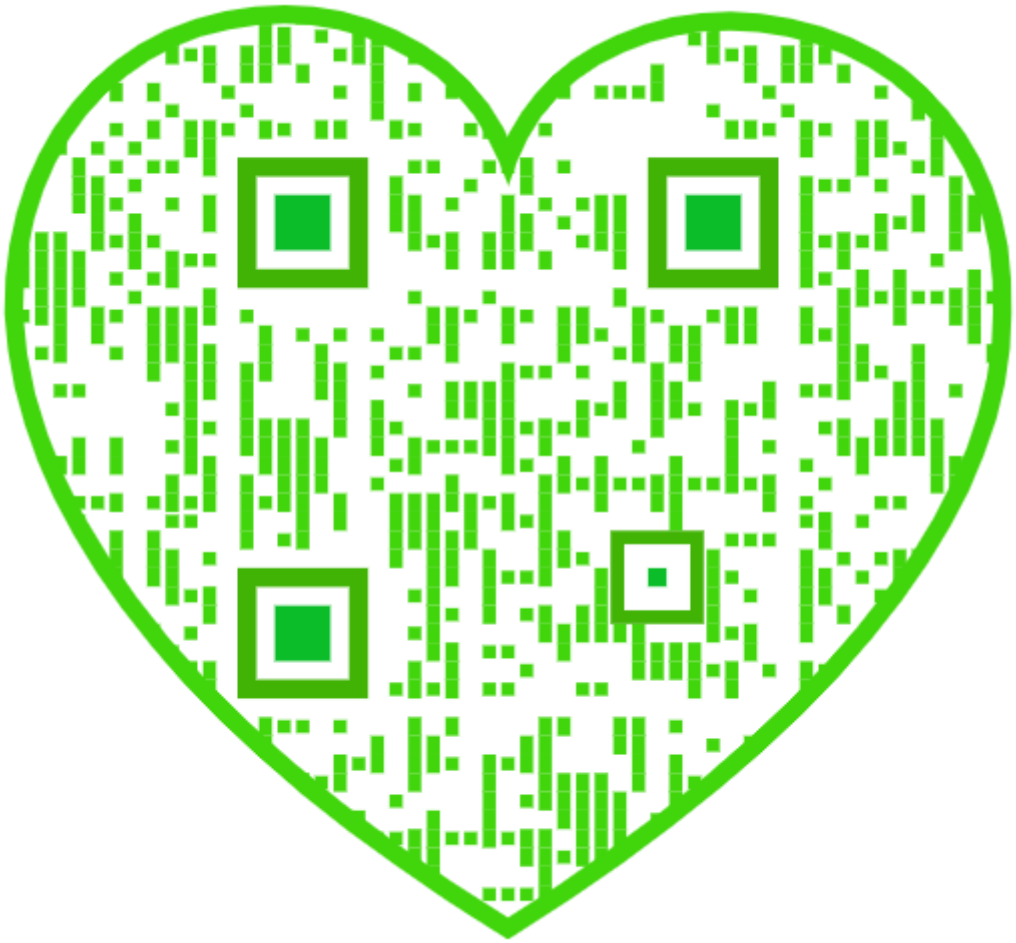

A HALL SETTLE:

AFTER AN OLD BEDSTEAD OF THE SHERATON PERIOD.

BY E. BONNEY STEYNE.

WAITING for an omnibus at a corner of the Kensington High Road, some few weeks ago, a fine piece of joinery of the Chippendale period attracted my attention. There was just time to see it was a dismantled bedstead when I had to climb the swaying steps and bid it a last farewell, from the lofty if economic perch from which so many town-folks survey the metropolis daily.

Throughout the day the fascination of that discarded piece of furniture kept haunting me, and by the afternoon became so irresistible, that, forgetting prudence, daring even the oration on my extreme folly in buying a thing with such awful suggestiveness of zoology as an old bedstead, I turned in at the first telegraph office and wired to the vague address, for I knew neither name nor number, nor even the street in which the shop was situated. Just as I had done so, I met a friend who lives near me—he being also an innocent lunatic upon old furniture—who at once volunteered to leave his 'bus in passing and secure the treasure. How he did so, and how when I called to pay for it—in gold, look you!—a curious chain of mistakes and uncircumstantial evidence, based upon wrong identity, nearly landed me in Her Majesty's keeping as a dynamiter, would take too long to tell. Besides, in real life there is not that artistic climax which should cap a good story. Yet, in sober truth, the first result of my purchase was to be regarded in the neighbourhood I pass daily as a dynamite conspirator who had eluded justice. This to one who is not an expert at pistol-shooting even, who never began his career as a head executioner by decapitating a guinea-pig, and who has so far blown up no one, except metaphorically, is naturally a haunting experience, that could no more be kept out of this paper than I could induce the powers that be to afford shelter indoors for my purchase when it arrived at my house.

Looking carefully at the really beautiful workmanship of this discarded couch, one realised how, in spite of all changes of fashion, whole-hearted and honest effort survives long after specious imitations succumb. When one passes the tempting windows of the furnishing emporiums today, and hazards a guess as to the probable duration of most of their tempting handiwork, the conclusion is appalling. Hardly one article in a hundred is likely to outlast a century, even supposing it has careful treatment; for nearly everything to-day pretends to be more important than it is—not with the old sham of veneer: we are too honest for that—for it deceived no one—and we have no wish to be found out in our own impostures. The dishonesty of to-day's work is rather to be noticed when you attempt to pull a drawer out of its place and it sticks, or coming out with a jerk, displays craft of the packing-case order in a piece of furniture with a façade adapted for a drawing-room.

The old mahogany furniture was often veneered—a disgraceful pretence that every one will condemn with dignified indignation; but its parts out of sight, were of good wood, well seasoned, neatly wrought and excellently finished. Now the front may be of polished pine, its honesty as transparent as its varnish, but the coarse deal and yet coarser workmanship of all that is hidden are surely as deadly a sin as ever veneer could be.

The old furniture well veneered made no pretence at being honest. If it deceived any one into thinking that planks of such superfine grain could be lavished upon one article of furniture, they had their own folly to blame for the misconception. But its descendant vaunts its honesty, and with machine-made mouldings, carvings if not machine made actually, yet produced by division of labour, that in its arithmetic forgot to include brains, and divided them out of existence—yet poses as a virtuous example of pure, unadulterated craft.

The old bedstead could supply a text for a never-ending homily upon sound workmanship, but the society of to-day cannot be expected to abandon its craving for profit upon any abstract quest. It all comes to a question of so much extra per cent. for the capitalist, or so many less hours labour for the artisan.

But if, as one imagines, the readers of WORK (some of them compelled, perhaps, to join in the manufacture of goods for the market to earn their income), in leisure hours turn to constructing furniture for their own homes—or the skilful amateur who spares not time or material to gain a good result—these may find a store of useful hints from this one salvage of the past.

It is hardly likely that anybody will care to construct a bedstead in wood. Many reasons, sanitary and social, have expelled the wooden variety, and replaced it by metal. But for tables, couches, and chairs, for all sorts of cabinet work, the motive of the panels illustrated will be found easy for adaptation.

The furniture that I made in fancy from this old bedstead would fill a small house. Tables, chairs, a modernised bedstead, a settle, overmantel, and a few others never came from theory to fact, except one settle made from the head-board, the rest of the structure being at present unused. There is enough timber left to build a house; certainly one beam of the half-dozen at least could be warranted to smash a settle of the shop window order by its dead weight.

The posts of the bedstead were of too gigantic a scale to be suitable for furniture, and readers of WORK do not need to be told that "Bedpostesses," as the old folks call them, are not to be used for cutting up. They will supply material for another article in WORK later on.

The head-board—I know no other name for it—was built up of a curious mixture of framing and lattice-work common to the period of its make, but rarely used at any other, and apparently suggested by Chinese originals.

This joinery, although requiring neatness and patient care, demands nothing but skilled mechanism, and may be wrought to perfection by those unable to cope with intricacies of the Chippendale style, and still less able to undertake the carving or inlaying that belongs to the Adams period.

The motive of the whole design is a fluted rod in effect—and possibly in reality—two rods with simply rounded edges laid side to side. These are strengthened by simply rounded pieces of the thickness of the double rod, but without fluting, as shown in Fig. 5. By the use of these thin rods the bent portion of the design becomes easily practicable. The idea of this work is well adapted for other furniture.

In the settle, having decided on creating new legs, a design (modified from the bedposts) of simply turned rings, stopping in a square to admit the rods, was found in keeping. The arms were borrowed from an old example of an earlier period that was easily modified to suit the worker's taste.

Rods treated as those of the back were added between the legs and below the arms. The crossed work of the panel was also, like all the rods used, of the reeded pattern seen in Fig. 6.

The seat was made of framework from the laths of the bedstead, and covered with a loose cushion; in the sketch a plain wooden seat is indicated as more suitable for use in a hall.

The whole work in a dark rosewood looks exceedingly well, the new mahogany used being stained and polished to match the older portion.

A CHAT ABOUT PHOTOGRAPHIC LENSES.

BY WALTER E. WOODBURY.

WHEN we decide to take up Photography, either for pastime or profit, the most difficult task that confronts us is the choosing and purchasing of a lens or lenses. It is the most important part of the apparatus. The lens makes the picture; the camera is, comparatively, of no importance at all; it is merely a light tight box, fitted with arrangements to bring the lens nearer to, or farther from, the plate, and to alter the position of the latter. Of course, cameras can be purchased to any amount of money, but it is not a difficult task to choose one. It is an easy matter for even a beginner to judge whether the workmanship is good, and any instruction book will tell him the different movements it should have.

But with lenses it is a different matter entirely. We see only a few pieces of glass encased in a brass tube—a simple enough looking contrivance. We have two shown us—one can be had for a few shillings, while the price of the other is seventy-five pounds. Perhaps, to our mind, the cheaper one possesses the best appearance. But it is not that we want; will it do the same work? Certainly not; hence the vast difference in the cost. But this is the difficulty; it is necessary, therefore, that the intending purchaser should possess a little knowledge of photographic optics. When he first contemplates the purchase of a lens, he he is confronted with such words as "Achromatic," "Rectilinear," "Wide-Angle," and such terms as "Depth of Focus," "Working Aperture," etc., which floor him somewhat.

It is the object of the writer to explain to the best of his ability the principle of photographic optics, and the meaning of the words and terms mentioned.

Now, first to give some idea of the use of having a lens, because we know that it is possible to make a fairly good picture without. Let us enter a darkened room, and having bored a hole through the shutter of the window, and bevelled off the edges so that it shall not be tubular, we find on the wall opposite an inverted image of the scene outside. For the sake of simplicity, let us take one object—a tree. From every point in the tree a ray of light emanates, passes through the whole, and lights up the screen with its own colour. The accompanying sketch (Fig. 1) shows the direction of the rays and how the image is inverted. We have

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here a perfect camera obscura, and one that might be made practical use of in photography but for one reason: the hole in the shutter must have some definite size. If it be very large, then every spot in the screen opposite would receive light from all directions, and the images overlapping each other, the picture would be but poorly defined. The smaller the hole is, the sharper the definition, so that, as has already been mentioned, not at all bad pictures have been made with an aperture made with the prick of a needle in tinfoil or other suitable substance. But the difficulty that now presents itself is this: if we make the hole very minute in order to get a sharply defined image, we have to sacrifice so much light that our image is but faintly visible, and the sensitive plate used in photography would have to be exposed for a great length of time.

What we want, then, is to enlarge the hole, and to place in it a lens. The effect of this will be that, having a larger aperture, we obtain more light, and, notwithstanding the fact that the hole is considerably larger, all the rays of light will meet at a point, as shown in Fig. 2, which illustrates the simplest form of lens. By means of this lens we may obtain a fairly good picture, but, at the same time, the laws of optics have to be considered, and very many kinds of complicated combinations of lenses have been made for various kinds of work. But still, however complicated these combinations may be—and the reasons of combining different lenses will be hereafter explained—yet the principal object is the same: namely, to produce the effect shown in the drawing last referred to. It is necessary to bring a set of parallel or diverging light rays to a point.

Lenses may be defined as transparent media bounded by spherical surfaces, of which the intersection is a line without sensible thickness. They may be divided into two classes: *i.e.*, convergent and divergent lenses. Convergent lenses are those which are thicker at their central part than at their margins. In Fig. 3 we have three illustrations of this kind of lens: the bi-convex (A), the plano-convex (B), and the convergent meniscus (C). Divergent lenses are, on the contrary, thinner at their central portion than at their margins. Fig. 4 shows us three kinds of divergent lenses: the bi-concave (D), the plano-concave (E), and the divergent meniscus (F).

All photographic lenses are constructed with one or more of these lenses, either cemented together to form a combination, or adjusted at a distance from each other in the tubular case.

Jean Baptiste Porta, who was the inventor of the camera obscura, first used as a lens a plano-convex one, the convex side being turned towards the ground glass or screen upon which the image was thrown. The result of using a lens of this description would be the complete distortion of the image. Thus, if we were to photograph a series of lines or squares, as in Fig. 5, the resulting image thrown upon the screen would be as in Fig. 6. This is termed distortion. In photographing a landscape in which there are no lengthy straight lines, this distortion would, to an unpractised eye be imperceptible; but when we have architectural subjects to deal with it will be easily understood that this defect would be very serious. Another thing with regard to a lens of this description: it was soon found out, on the introduction of the daguerrotype process in 1839, that, although it was suitable for camera obscura pictures to view with the eye, yet, when used for photographic purposes it was of little use, for the reason that the chemical focus was different to the visual: that is to say, that when the picture upon the ground glass is sharply focussed to the eye, the effect upon the sensitive plate was to give an unsharp image. This defect is termed "chromatic aberration." It was then necessary to render the lens achromatic, which is a term often used, and the student will better understand its meaning. It was found that this chromatic aberration could be destroyed or neutralised, and the lens thus made achromatic by joining two lenses of different dispersive power and of different material, the convergent lens being made of crown glass, and the divergent of flint glass. These are cemented together with Canada balsam. Two forms of achromatic lenses are shown in Figs. 7 and 8; the letters C and F denote crown and flint glass.

Another defect which occurs in lenses (and in purchasing it is absolutely necessary that the student should know that these defects are corrected) is what is termed "roundness of field." In making a photograph, we require to throw a sharp, perfectly true image upon a flat screen. Now this is, in reality, an impossibility. It will be seen, on reference to Fig. 9, that the screen should have a concave form equal to the curvature of the field of the image. The points A, B, C in the distant plane are very nearly equidistant from the convergent lens, D. It will be evident that the images of these three points will be formed, at distances from the optical centre of the lens, nearly equal to the principal focal length. If, therefore, the image is thrown upon the plane H E, the sharpness of the points A and C will be sacrificed. The field to receive the image shape, must be curved. There are several ways of counteracting this defect of curvature or roundness of field, and to give what is termed a "flat field," although it is but comparatively flat.

I find that I have had to make use of two terms: *i.e.*, "optical centre" and "the focal length"; and it will be necessary before going farther to explain the meaning of these.

In every lens there is a principal axis and an optical centre. The line A A′ (Fig. 10) is the principal axis, and situated in this axis there exists a point, through which every ray passing through it does not deviate; this point is called the optical centre of the lens. To find this optical centre, Dr. Monckhoven's plan is as follows: through the centres of curvature A A′ of its surfaces draw two radii, A B′ and A′ B, parallel to each other, but oblique to the axis, A A′; then join their extremities, B B′; this line will cut the principal axis at C—which is the optical centre. It must be understood that this applies only to single lenses. In combinations there is no optical centre, nor any point at all analogous to it. I have shown the position of the optical centre in a double convex lens: it is inside the glass. In the case of a plano-convex lens, it is situated at the centre of the face of the back surface, while in a meniscus lens it is outside the glass and behind it. Another method of determining the optical centre of a lens is as follows:—

If r be the radius of the front surface of the lens, s the radius of the back surface, and t the thickness of the lens, then the distance of the optical centre measured along the axis of the lens from the centre of the face of the front surface is equal to $\frac{r\,t}{s\,r}$

The focal length, or focus, as it is more often called, is the distance between the centre of the lens and the ground glass when a distant object is sharply focussed. In the case of a double combination lens it is measured from the stop, or diaphragm, which is placed in the centre: thus, we refer to a lens as having a focal length of ten inches, or ten inch focus. We now know the meaning of focal length and focus. We have next to find out the meaning of what is termed "depth of focus," and also the use of stops or diaphragms. Briefly, then, the depth of focus of a lens is its power of giving a clear image of objects at unequal distances. When we take a camera, and erect a single combination focus upon a landscape, it will be at once apparent to us that we can advance or withdraw the ground glass to a slight extent without altering the focus of certain objects, whilst we bring into focus others placed at a different distance. Depth of focus varies with the aperture of the lens. By aperture we refer to the opening of the lens which admits light. When a stop or diaphragm is used, it is the diameter of the opening of this, otherwise the diameter of the opening of the smallest of the combination of lenses; or if all be of the same size, then the whole of the front one is calculated. As we have already pointed out, the depth of focus varies with the aperture of the lens, and also with the distance of the objects. Some lenses, however, possess greater depth of focus than others.

The stop is a piece of blackened metal, with a central aperture placed between the two combinations back and front of a lens. There are usually a number of these, with apertures of different diameter. They are generally separate from the lens, but a more convenient form is that known as the Iris diaphragm (as shown attached to the lens, Fig. 11), or another is the Waterhouse diaphragm (shown in Fig. 12). They are much more convenient than the loose ones, which are apt to get lost. These stops, or diaphragms, and the aperture of the lenses are all numbered, or referred to according to their width of aperture in comparison with the length of focus of the lens. Thus, for example, we have a lens the focal length of which is found to be ten inches: the aperture of the lens is two and a half inches, or one quarter the focal distance. Therefore we say that the lens is working at *f* 4; now if we place in the lens a stop with a diameter of a $\frac{1}{4}$ of an inch we are working at *f* 40, or one-fortieth of the focal length; this stop is then marked *f* 40.

We now come to the angle of the lens; the width of angle of a lens differs according to the purpose for which it is intended. Fig. 13 represents a very wide angle lens, and Fig. 14 a narrow angle one. The wide angle lens is constructed for the purpose of making photographs of subjects which you wish to photograph entire, but cannot get far enough away to do it with an ordinary lens. But the employment of this kind of lens is never to be recommended: firstly, because it gives images different to those seen by the eye; and secondly, because to obtain sharp definition a very small stop has to be used, and it is consequently at most a very slow lens. Fig. 15 shows the exterior view of this kind of lens.

Let us now consider the question of rapidity in a lens. By rapidity is meant the relative time required for exposure of the image

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with different lenses upon a plate of known sensitiveness. This rapidity varies very considerably, even with the same subject and same light, and it is based entirely upon the relation between the focal length and the aperture, independent of size; thus, if two lenses were tested together, the one has a focal length of 10 in. and an aperture of 2½ in., and the other is considerably larger; it has a focal length of 40 in. and an aperture of 10 in., yet the aperture in both cases is one-fourth of the focal length, termed *f*4, so that by the rule already given the time of exposure of an equally lighted subject upon an equally sensitive plate would be precisely the same in both cases. By this means it is always very easy to tell the relative rapidity of one lens or stop with another; we have only to square the denominator of the fractions *f*4, *f*8, etc., when we will have the same exposure; thus, if we are working with a stop of *f*4, namely, one that is one-fourth of the focal length of the lens to which it belongs, and we desire to use *f*8, we square these two numbers, *f*4 and *f*8, and get 16 and 64 respectively, so that they are as 16 to 64; or, in other words, if with the stop *f*4 we required an exposure of one second, we should with *f*8 require an exposure of four seconds.

The use of the stop, therefore, is to regulate the passage of the rays of light through the lens, to increase the depth of focus, and to correct the roundness of the field. The smaller the aperture the sharper the resulting picture, and the greater the depth of focus; but we must also remember that the smaller the stop the lesser the amount of light admitted, and, consequently, the longer the exposure requisite. The object in using these stops should be to secure the greatest amount of light together with the sharpness necessary to produce a satisfactory picture. We first focus on an object at a moderate distance, and beginning with the largest, insert each stop until we bring the other objects into focus. We now have some idea of the principle of a lens, the qualities it should possess, and its use. We must next consider the principal ones now in the market, how they are made, and what they are made for.

The first we have to consider is the simplest: the single combination. This lens is also known as the "landscape," "view lens," "meniscus," and "achromatic." It is composed of two glasses only, cemented together, as in Figs. 7 and 8, the glasses being of different material so as to be achromatic, as already referred to. This kind of lens is the cheapest, and is very good for landscape work; but we have already seen that it would be of no use for architectural subjects. It possesses an advantage over others for landscape work only, in consequence of its having but two reflecting surfaces, and thus gives a more brightly illuminated picture, and a flatter field.

But by purchasing a lens of this description, we are unfortunately tied down to landscape work, and if we desire to include a house or building in our view, the consequence is that we get a distortion of the straight lines, as shown in Fig. 6. We will therefore pass on to double combination lenses. Under this heading we include Portrait, Universal, Rapid Symmetrical, Rapid Rectilinear, Wide Angle Rectilinear, and Portable, symmetrical lenses. The advantage of a double combination rectilinear is that it is constructed to give straight lines, while if we choose we can remove one of the lenses and use the other as a single lens, the advantage of which has already been explained. The rapid rectilinear is the most popular lens of any, and has had a variety of names given to it, which it will be as well for the reader to know. They are: Rapid Doublet, Aplanatic Doublet, Rapid Symmetrical, Rectigraph, Orthopanactinic, Panorthoscope, Planographic, Hemispherique, Euryscope, Straight Line, and True View. All these lenses are constructed on the same principle, but of course those of such makers as Ross or Dallmeyer are superior in the quality of the

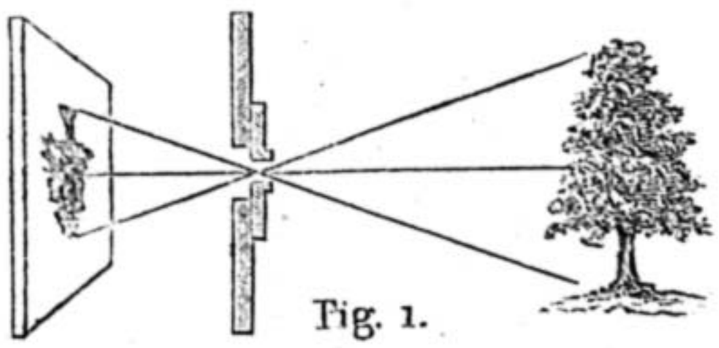

Fig. 1.

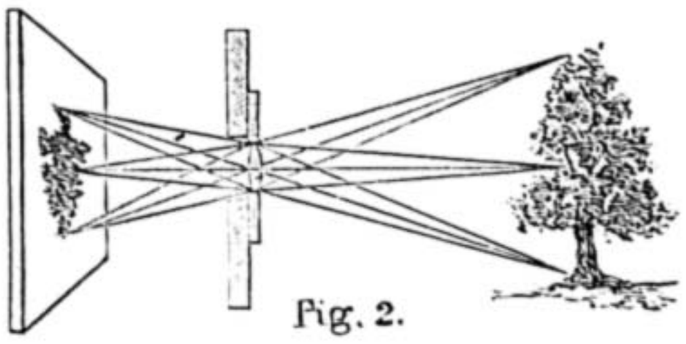

Fig. 2.

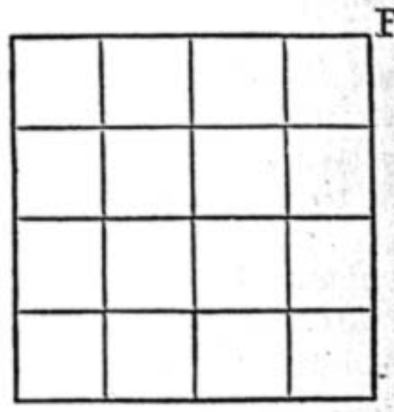

Fig. 5.

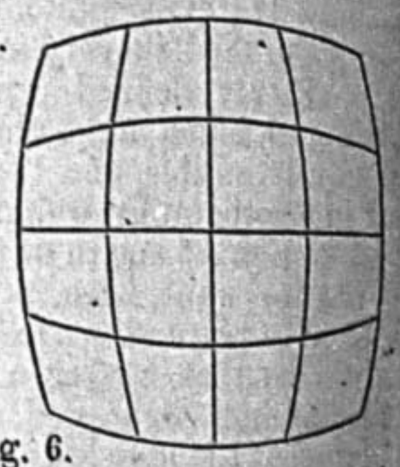

Fig. 6.

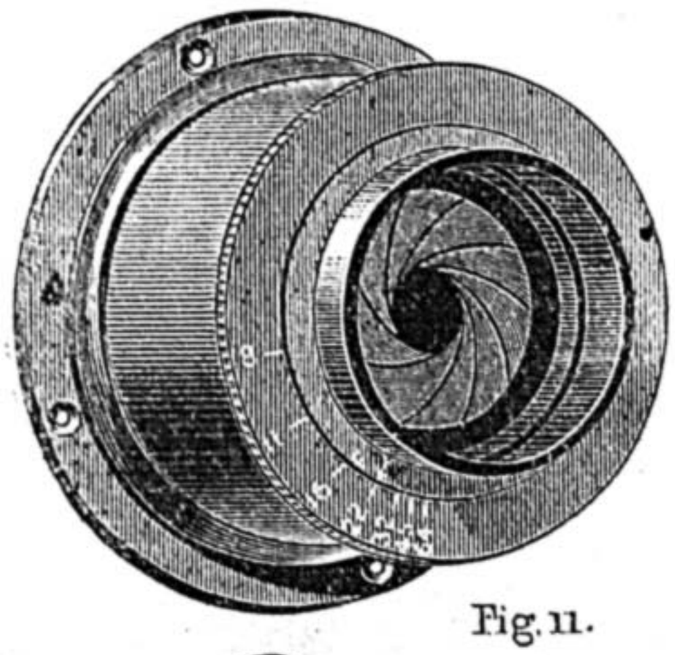

Fig. 11.

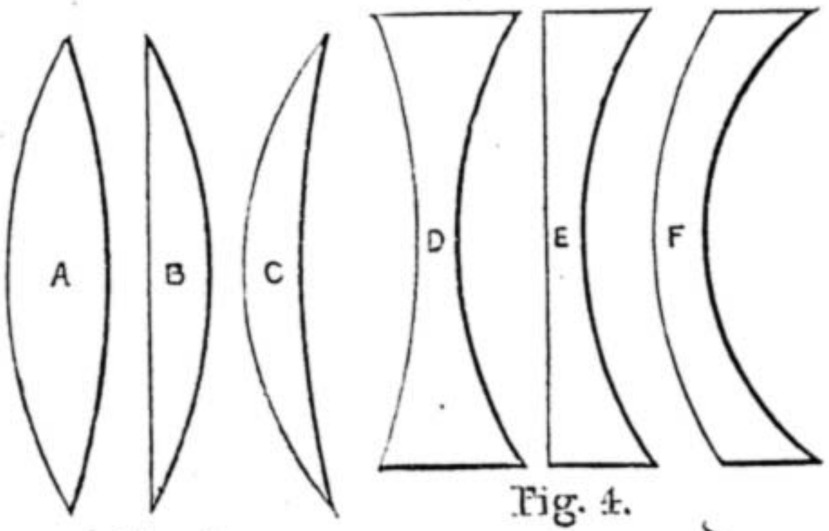

Fig. 3.

Fig. 4.

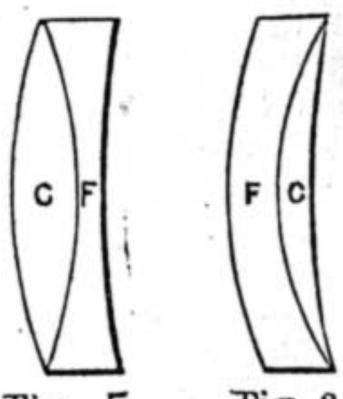

Fig. 7.

Fig. 8

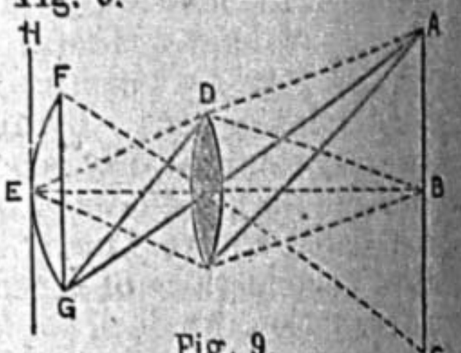

Fig. 9.

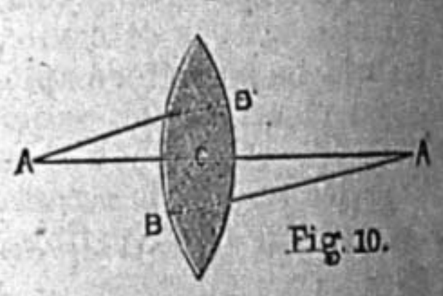

Fig. 10.

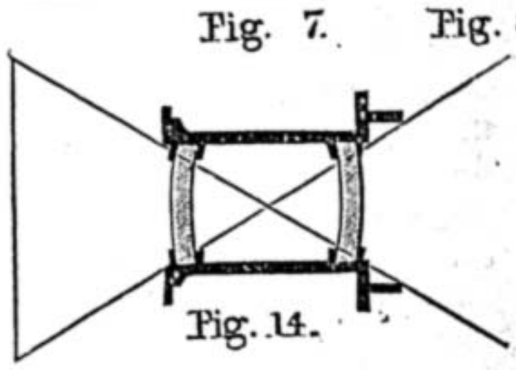

Fig. 14.

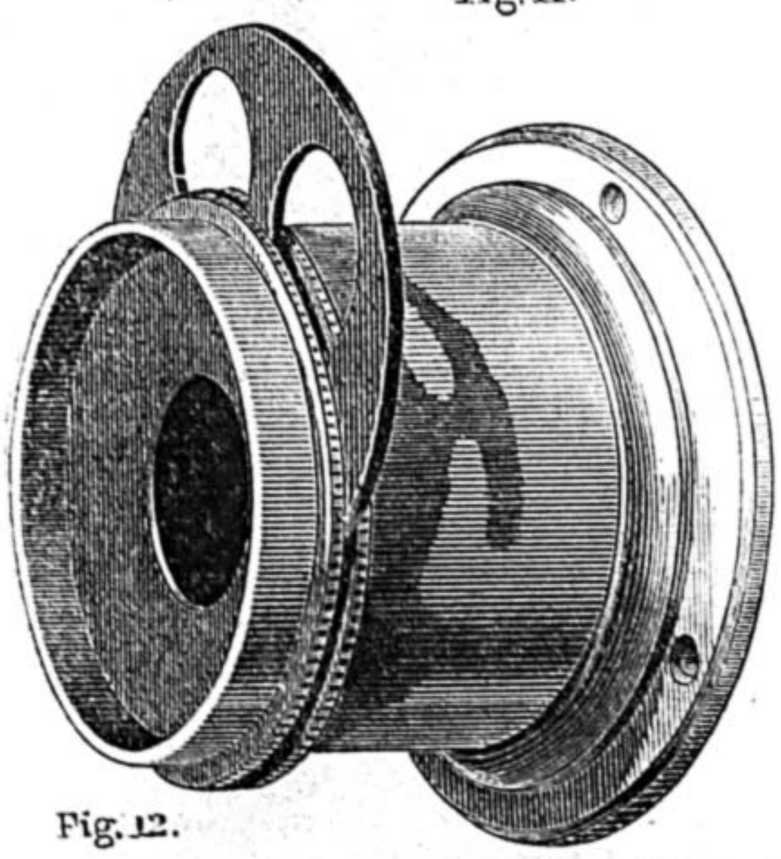

Fig. 12.

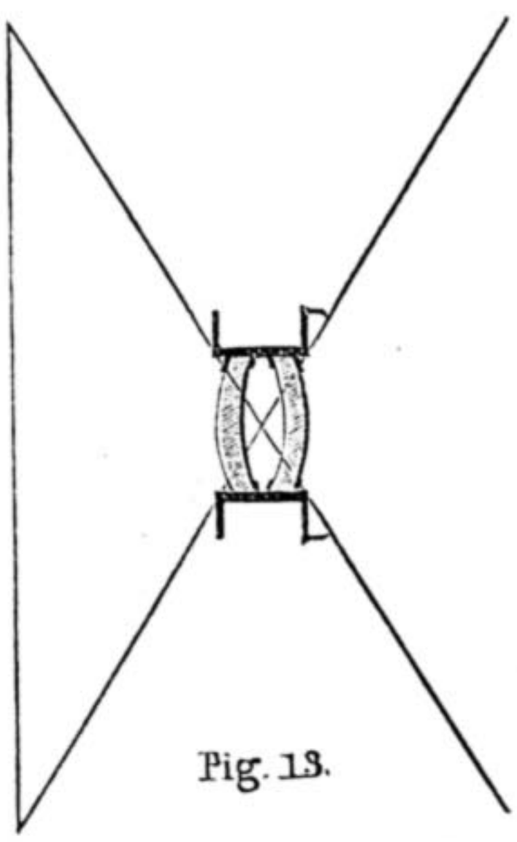

Fig. 13.

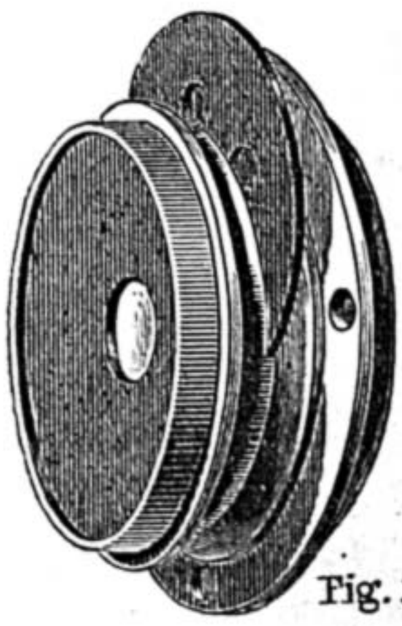

Fig. 15.

Fig. 16.

Fig. 1.—Diagram showing Direction of Rays of Light and Reversion of Image. Fig. 2.—Simplest Form of Lens. Fig. 3.—Convergent Lenses—A, Bi-Convex; B, Plano Convex; C, Convergent Meniscus. Fig. 4.—Divergent Lenses—D, Bi-Concave; E, Plano-Concave; F, Divergent Meniscus. Fig. 5.—Series of Lines or Squares to be photographed. Fig. 6.—Result obtained by Plano-Convex Lens. Figs. 7, 8.—Achromatic Lenses. Fig. 9.—Concave Screen desirable for Photographic Image. Fig. 10.—Axis and Optical Centre of Lens. Fig. 11.—Diaphragm for Lens. Fig. 12.—Waterhouse Diaphragm. Fig. 13.—Wide Angle Lens. Fig. 14.—Narrow Angle Lens. Fig. 15.—Exterior View of Wide Angle Lens. Fig. 16.—Rapid Rectilinear Lens.

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material and in the grinding and setting of the lenses; the outer case is nothing. With a lens of this description it is then possible to make pictures of views, buildings, and groups, and is one that is recommended to beginners. Prices will differ according to the maker; for instance, Dallmeyer's price for a whole-plate lens of this description is £9, while another maker charges £3; but the former is undoubtedly worth treble the latter, so if the beginner can afford it he should always purchase from a good maker, or if not, and he is recommended to take a cheaper one, he should take it on trial only. Never purchase a second-hand lens unless you are an expert photographer, and know what you are buying.

I have said that the rapid rectilinear lens already described is suitable for buildings, but it very often happens that we require to photograph interiors or a house in a narrow street. As we cannot get far away from it with an ordinary lens, we should in the latter case succeed only in photographing the doorway perhaps. Here comes the advantage of possessing a wide-angle lens, as shown in Fig. 13, and the principle of which I have already explained. I have also pointed out the advisability of using it only when compulsory. Although it is a useful adjunct to a photographer's kit, its possession is not absolutely indispensable.

We next come to portrait lenses. The principle upon which these lenses are made is to get rapidity; consequently, they have little depth of focus. They can only be used for portrait work, and are the most expensive lens, as much as £75 being required for the largest size. The amateur will not require a lens of this description: he will find that he can make fairly good portraits with his rapid rectilinear (Fig. 16), although the exposure is considerably longer.

In purchasing a lens, we require to be assured that it is achromatic, that it is rectilinear, and that its average power is sufficient for our camera. If the light from a lens is thrown upon a large screen, it gives a circle of illumination, the brightest and most uniformly lighter part of which is from the centre portion to a certain distance towards the edge; after this the light gradually fades away. Now we measure off the largest photographic standard size that we can get in the uniformly lighted part, this being the covering power of the lens. Many lenses sold will not cover the plate they are stated to do: this must be seen before completing your purchase, otherwise all your pictures will possess a black shade at the corners, the lens being unable to cover them with its illumination, or, in other words, its covering power is much smaller than indicated. It is always as well to buy a lens a size larger than the camera you are going to use it for; thus for a 10×8 in. camera, a 12×10 in. lens will give nicer and better covered pictures.

A word or two on the keeping of lenses, and I will close. A lens should be kept when not in use, in a bag of chamois leather of the best and softest kind, and when taken out for use, the glasses should be gently polished with an old silk handkerchief and stood in a warm place. It is impossible to insist too strongly on the necessity of taking care of lenses and of keeping them safely housed—if the expression may be permitted—perfectly clean, and scrupulously bright and well polished. To secure the ends that will be the outcome of such keeping no better plan than the one given can be devised.

THE MECHANICAL PROCESSES OF SCULPTURE.

BY MARK MALLETT.

Casting in Plaster.

THE MANUFACTURE OF PLASTER — DIFFERENT KINDS AND THEIR USES — AN EXAMPLE IN WASTE-MOULDING — INNER AND OUTER MOULDS — SEPARATING FROM THE CLAY MODEL — WASHING THE MOULD — MAKING THE CAST — CHIPPING OUT.

HAVING considered the operations involved in modelling in clay, we may now pass on to the next process that demands consideration, namely, casting in plaster, and this part of my subject it is fair to suppose will prove more generally useful than modelling in clay, and appeal to a far larger circle of workers.

Whilst it remains in the clay a model is more or less a source of anxiety. It needs constant care; it may suffer from too much drying or too much wetting; frost may injure it; and any accident which happens to it can only be repaired by a repetition of the slow labour with which it was originally formed. But when cast in plaster it is tolerably safe from everything but accidental breakages, and even these it is possible to mend quickly and effectually. No wonder therefore that the modeller should always desire to see his work in plaster as soon as possible.

Plaster, called for distinction "Plaster of Paris," is made from gypsum or alabaster. This stone is formed of sulphate of lime—that is to say, of lime in combination with sulphuric acid and some 22 per cent. of water. To make plaster, the water is driven off by burning and the stone reduced to a powder; and it has the property of once more hardening into a kind of stone when again mixed with water. The discovery of this quality in gypsum made an epoch in the history of the arts. Its distinctive name is owing to plaster having first been brought to this country from the gypsum-works at Montmartre, near Paris. The stone

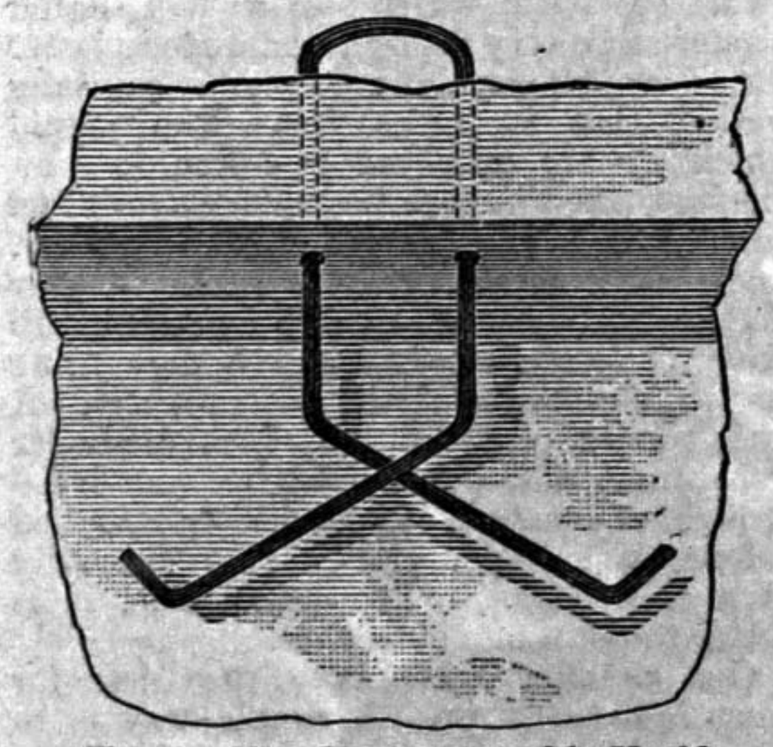

Fig. 18.—Wire Loop arranged in Mould.

is found, and has long been worked, in many parts of our own country, Derbyshire being now one of our chief sources of supply.

To prepare plaster, the alabaster is calcined, and then ground in a mill. Three qualities are sent to market. *Coarse* ordinary plaster is only to a certain extent to be called white; it is rather a very light brown, and is full of minute dark specks, caused by iron and other impurities. Builders use it for various purposes, and in the work before us it is employed, on account of its cheapness, for "backing" moulds and casts. *Fine* plaster is made from picked stones; it has a good white colour, and is chiefly used in the casting of figures. *Superfine* plaster is made from stones picked with especial care, and from which every speck of impurity is cut away. The supply of this is limited. It is dazzlingly white, and is chiefly used for "facing" such small casts as are to be protected by glass. Plaster is sold retail by the bag of 14 lbs., or the half-bag of 7 lbs., and wholesale by the sack of 2 cwts. Coarse may be bought at any colourman's at 5d. per bag; fine at any plaster moulder's, at 1s.; and superfine at the more important figure moulder's only, at 3s. per bag. Coarse and fine are to be bought by the sack at much lower rates; superfine is rarely bought in quantity.

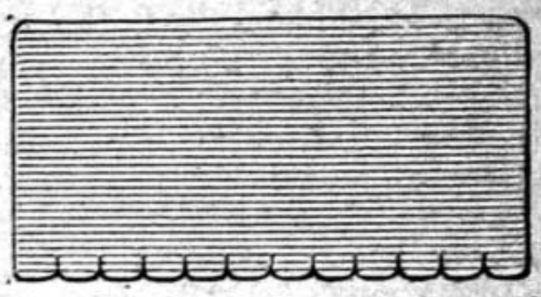

Fig. 19.—Plaster Drag (Scale, half size).

The power of setting in plaster depends on its freedom from moisture. It sets rapidly whilst fresh; but as it can rarely be kept without absorbing moisture from the air, its power of setting gradually decreases, and is after a time lost. Any attempt to cast with plaster thus spent will result in failure, and in the ruin of the model. Unless, therefore, the moulder has reasons for feeling sure of his plaster, he will do well, before using it, to try a little, and observe whether it sets properly, and how soon. Quite fresh plaster, though in a general way desirable, is not perhaps the best for a beginner, as the rapidity with which it sets may hurry him too much over operations with which he is not familiar. In tins which fit so closely as to exclude all air, plaster may be kept good for years.

To give an example of casting in its most simple form let us presume that the relief of the Apollo, supposed in a former paper to have been modelled by us, is about to be cast. Our imaginary modeller, who is now to be our imaginary moulder, having laid the model (which, it will be remembered, is in relief, on a clay slab) flat on its back, will probably blow water over it with his mouth in that manner described on a former page as calculated to shock the sensibilities of the fastidious; but in no other way could he moisten the whole surface so regularly, so gently, and so completely. This moistening freshens up the work, adding to the apparent finish, and making the plaster spread over the clay more freely; but if so much water has been thrown on as to remain in pools in the hollows, the sponge must be used to remove it, or the plaster would not set properly in these hollows.

It is desirable, for reasons which will appear hereafter, that the inner mould—that part of the mould which comes next the model—should be tinged with colour. Some use ochre or similar pigments, but nothing is better or more easily mixed than common ink. A smaller quantity suffices than of anything else, and instead of softening, as most other colours do, it seems to harden the plaster. As much water as will be required for making the whole of the inner mould is first tinged, and with this the plaster is mixed; this insures uniformity of colour. The tinge should be but a very slight one, just sufficient to make a clear distinction between the coloured mould and the white cast; much colouring matter might stain and disfigure the cast itself.

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Taking a handful of plaster, the moulder sprinkles it into a basin two-thirds full of the coloured water. This is done carefully with the hand, that he may detect and lay aside any lumps, etc., which may occur. The plaster, falling on the surface of the water, becomes gradually soaked, and sinks, and the sprinkling is continued till, instead of sinking, the plaster begins to stand in a heap above the level of the water. This shows that no more plaster is needed.

This is the proper way of mixing plaster: the gradual saturation from below expels the air quietly, without causing bubbles; also, by this method, the moulder is able to see when exactly the proper proportion of plaster has been added to the water.

The mixture is now beaten up with a spoon. If he were beating superfine, for very delicate work, he would probably use a silver spoon, as least likely to cause discolourment. There is a proper way of beating plaster. The moulder puts the bowl of his spoon to the bottom of his basin, and by moving it rapidly with a circular motion, and without bringing it to the surface, he makes the mixture thoroughly "boil up." He avoids bringing the spoon-bowl to the surface, lest it should carry down air with it, and cause bubbles; for air-bubbles are enemies of which he stands specially in dread. When the plaster is well mixed, he skims off and throws aside any bubbles or scum that may have arisen, and his plaster—which is of about the consistency of cream—is ready for use.

With his spoon he throws it over the model, dashing it into all hollows and undercuttings, so that no part of the clay may be left uncovered. Into places which he cannot otherwise reach, he blows the liquid plaster with a pair of bellows.

All these operations have to be gone through rapidly; and if his plaster is very fresh, the moulder will have to bestir himself all the more, or it will set too quickly for him. Having emptied his basin, he hastily swills it out, and mixes a second supply, proceeding as before, till about ¼ in. of plaster covers every part of the model. He does not, however, care that it should have an even surface, for some little lumps and irregularities will serve to bind it to the outer mould.

The inner mould has now been formed, and whilst it is setting, the moulder occupies himself with mixing a little clay and water, so as to make a sort of "duck puddle." This he brushes over the inner mould when set, to enable him to separate the two moulds when he requires to do so, otherwise they would form into one mass. Here and there, however, he leaves a little island of plaster undaubed with the clay-water, for he does not wish the two moulds to separate too easily.

The outer mould, with which the thin inner one is now to be covered, he mixes with plain water; and when this has been spread to the depth of another ¼ in., he will pause for some five minutes for it to set, for it is now time to strengthen the mould with irons. These are desirable, partly because in setting and growing hot the mould has a tendency to warp, and partly because the use of irons gives the necessary strength with far less waste of plaster. Those who do much moulding, keep by them a quantity of thin iron bars, bent in all possible directions, for the purpose; but old window-bars, or any odd pieces of iron that may come to hand, will suffice. After these have been laid on the mould, more plaster is added to embed them, especially towards their ends. To his outer mould our moulder will probably give a general thickness of about ¾ in.

Whilst making the earlier parts of his mould he will have used fine plaster; but for "backing up," or perhaps for the whole of the outer mould, he will have contented himself with coarse.

The plaster, if good, will have set quite hard in half an hour, or less, and he will then proceed to separate it from the clay model. This is to be done rather by persuasion than force. If he works the mould gently backwards and forwards with his hand, some little chink between it and the clay is sure to appear; into this he pours water, and continues to work the mould. After a little while the water softens the face of the clay, the chink opens wider and wider, and presently mould and model come easily apart.

In the case of a model in very low relief, if this is done carefully, the mould may be removed without in any way injuring the surface of the work beneath. The writer has repeatedly taken more moulds than one from the same model. But this will scarcely be done with our Apollo; for, though the great bulk of the clay will come out intact, certain locks of hair and other projecting parts will remain sticking in the mould, and will have to be picked out.

The mould is now washed, which must be done thoroughly, but without disturbing its face. Our moulder will use a soft sponge and plenty of soap. If there are hollows not to be reached by the sponge, he will use a soft brush in them (sable or camel-hair); and if he can, he will swill his mould by placing it under a good stream of clean water, as from a tap.

Many people have an idea that, to make the cast leave it, every mould needs to be greased. Such is not the case. Plaster in a liquid state will not adhere to that which is hardened if the latter is *thoroughly* saturated with water. Nor will liquid plaster stick very firmly to hardened plaster which is quite dry; it is to plaster partially wetted that it sticks fast. The mould which we are watching has been so completely soaked in cleaning, that we may feel quite sure it will leave the cast properly. There is generally more reason to fear that a fresh mould like the present will leave too freely, in which case it may bring off projecting bits of the cast with it. A stale mould—one that has been made for some time, and allowed to become dry—though, of course, it would be well soaked before being filled, rarely leaves so readily as a fresh one. When practicable, it is better to use a mould at once.

Our moulder will make provision for hanging his cast up. A simple way is to insert a loop or loops of copper wire into the plaster slab which forms the background. Holes, therefore, should now be bored through the edge of the mould, and the wire arranged somewhat as shown in Fig. 18. The wire will then be safely embedded in the plaster when the mould is filled.

The actual making of the cast—the filling of the mould with plaster—is quite a simple operation. For the work in hand, our moulder will face with fine plaster. This he will mix as previously, only using *plain* water; and when mixed, he will pour it into the mould, which he will gently rock and move from side to side, so as to make the liquid plaster flow to every part of its interior, and coat it all over. A second basinful, forming a second coating over this, will perhaps give a sufficient facing of fine; and if so, his after-mixings can be of coarse, till the cast is backed up to a sufficient thickness. This may perhaps be 1¼ in., for it is desirable to have such strength as will bear the blows of the mallet in the coming "chipping-out." A little superfluous thickness may easily be scraped away, but a breakage is a vexatious thing.

After the mould is filled, some employment may be found in smoothing down the back of the cast. A small steel drag, like that shown in Fig. 19, and which any one can make for himself out of some odd bit of flat steel, is most useful for this purpose, as for some others. A small mason's trowel is also handy in making up the back of a cast, and other uses.

He will soon find the cast hard enough for chipping-out. His tools will be a blunt chisel (one with the edge rounded off on the grindstone) and a mallet. It is well to be provided with chisels of two or three sizes. After he has chipped out and released the irons, he will probably be able to break off his outer mould in a few pieces, and by a few strokes. Yet he should be warned not to be too hasty. If it comes off in very large pieces, it may bring portions of the inner mould with it, and that will endanger the cast.

As he clears away his outer mould the use of the clay-water will be apparent, and also, to some extent, that of the tinting. If ink has been used, the inner mould will be of a light bluish-grey, and from this the outer mould will readily part, owing to the film of clay between them, whilst the difference of colour will prevent his driving his chisel into one in mistake for the other. The chief use of the colouring is, however, to distinguish the inner mould from the cast itself.

For clearing away the inner mould, it is well to fix the relief almost upright, that the chips may readily fall away. Our moulder now proceeds warily. He holds his chisel at almost right angles to the surface; this brings away the pieces of mould cleaner, and is less likely to bruise the cast than a sloping position. He is sure not to find his mould of one exact and uniform thickness throughout, and he must deal his blows accordingly, or his chisel may go too far and enter the cast. So far as possible, the inner mould should be made so thick all over as to bear a moderate blow. A soft clean brush is used to remove any small fragments of chip which do not fall way, and hollows are best cleaned out by blowing into them with the bellows.

The cast, as it emerges from the dull grey mould, will give no small delight to the young modeller, as he recognises his work in this new, and hard, and snowy white material. Every touch that he has given to the clay—even the most minute markings—he will see reproduced with absolute fidelity. He will find the work of chipping-out a most agreeable, and, indeed, fascinating one, and will grudge to leave it for a moment, till he sees the whole model uncovered.

To the experienced worker, perhaps, the interest may not be so intense. He has no fears as to results, knowing well that when the operations of casting have been properly performed, the cast cannot fail of being on the whole satisfactory; yet clearing away a mould is pleasant work at all times.

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WAX-ENDS: HOW TO MAKE THEM.

BY J. C. KING.

Of course inquirers know that they can go to a shoemaker and get taught how to make a wax-end, but surely, if an efficient reply be given, it tells every reader of WORK who cares to know, and saves so many the trouble of going to a shoemaker's to learn. It is just that desire to learn from the best source that prompts the question in these pages; even though writing the letter on a matter like that of "wax-ends" would be about as much trouble as learning from a shoemaker to do it from seeing it done. We want knowledge not selfishly, but that others may share it—at least, I hope so. We seek to *learn*, as well as be *taught*.

In discoursing about the making of wax-ends, the first thing will be to show *how to do it*.

To make a wax-end, get your hemp or flax, coarse or fine, just as you want it for light or heavy work, the flax being used for the finest work, the hemp generally for rough strong threads. Open your ball from the middle; if you commence from the outside, the ball soon becomes a loose "harl," and the fibre will be linked and ruptured in trying to draw out a bit of straight thread. You have to decide how many "ply," or threads, you want in your wax-end; you may use one or many. Now you must take a brief lesson in textile technics before you can begin. Your flax or thread, you will observe, is spun in the same direction as the hands of your watch turn; bear this in mind, or you cannot make a wax-end with certainty. This speck of knowledge you apply at the starting of your job, to unwind the twist of the thread; to break it or cut it would spoil the job at starting. There is one simple way to unwind adopted by all wax-thread makers. It is to draw, with the right hand, the fibre of flax or hemp with a rolling motion *upwards* on the right leg above the knee, which is raised about horizontal—the hand being wetted slightly with the tongue to give adhesion to the thread—the left hand holding the thread between the thumb and finger to prevent it turning. The palm of the right hand is used to unroll, the drawing up the leg being for about four inches at each stroke, the thread being lifted and shifted down for each starting stroke of unwinding; when expert at it, two threads of hemp or flax can be unwound at the same stroke, keeping them apart for about the space of half an inch as they roll on the thigh. After three or four strokes of the hand on the thread, it will be as in the accompanying sketch, A being the part held by the thumb and finger of left hand, B the unwound filaments, from two to three inches in length. Now comes the only really technical nicety about the job—the separation of the thread at this flossy bunch in such a way that the two ends shall be pointed bunches of filaments, each about 3 in. long. Now for another little lesson in textiles. The spun thread would sustain perhaps 20lbs. pull; the unwound thread is parted by little gentle snatches of the fingers, of less than an ounce at each snatch, to part the bunch of flossy thread. The fibres were held only by what is known as imbrication, or overlapping of the particles one on the other, and by what is also practically known as "felting" in fibres that cling to each other by imbrication, of which wool is one of the most tenacious, and horse-hair (mane or tail) and bristles the least tenacious, except one end of the bristles. You notice the left hand is the feeder and holder, the right the operator. Having detached, say, four feet of thread with one flossy end, you want both ends of each "ply" to be equally fine drawn to a point, so you serve about six or eight inches of the other end the same: that is, you waste that much to effect unwinding and pointing. You have now three flossy pointed ends. You lay one on the end still on the ball of hemp or flax, and draw the threads between the left thumb and finger till of the same length; then lay the thread to be unwound on the right leg as before, and unwind and separate in the same way as with the first. Arrange that both threads are not quite the same length from end to end. This you can only be sure of after some practice; but by holding the two threads half an inch apart between the thumb and fingers of left hand while you unwind it will ensure accuracy. If one thread should by chance get rolled over the other in unwinding, they will not cling together to hurt. You hold, not only the first, but all the threads on your leg as you unwind, but just out of the way of the one you are unwinding, or let the unwound ends hang from the left hand loosely. You will now find you have two or more complete threads, and an end to start another length, which you work off in the same way, not laying the threads out of the left hand for a moment, merely keeping them from getting entangled at the ends in measuring off and unwinding. Suppose you have four "ply." You draw them all straight through the fingers to close them up slightly. Then you lightly draw the wax down the threads you hold in the middle with the left hand; this is done quite lightly, and one stroke does both ends of the thread at once; shift it in the hand a little, so as to do that part in the hand omitted at first waxing. This waxing must not be excessive, or it destroys the imbricating properties of the fibre: only just enough to give a slight sticky adhesion. Now comes the winding, called "winding a wax-end." Like the waxing, it is done on both ends or lengths from the middle of the thread at once, the middle being finished by shifting to do it. A hook, or button-stud in a table, is used to loop the thread over, and the doubled thread is kept apart by the finger and thumb of the left hand and the "lay" of the thread on the right leg. They must not touch each other, so as to roll over one another. The threads are rolled *downwards* now to wind one strand of fibre into the other, the rolling place on the threads being just where the flossy ends start, nowhere else. This winds the fibres into a spun thread of four "ply." You alternate the winding and the waxing, drawing the wax softly over the flossy ends so as not to clog them, or tear the delicate filaments off into the wax; these you have not wound at all yet, and barely waxed. The bristle, which at one end is seen to be split up into three fibrous ends, is laid in this flossy point for about two inches, and rolled downwards on the leg, with alternate waxings and rolling; both ends, if wanted, are bristled at the same time, and, by the same hand rolling, incorporated into the wax-ends. That quarter of an inch of the thread that took a loop over the hook or button is not omitted in winding or waxing. Both right and left hands are used to hold the wax in drawing the thread through them, to smooth any unevenness, and ensure a thorough saturation of wax into the thread by hand warmth; surfacing with wax only would be useless: in fact, it would not be a waxed thread. The wax must slightly fill the fibres. If needles are to be used instead of bristles, the thread is pointed by waxing and winding, but not too compactly, for more winding and imbrication has yet to be done. The needle (mostly blunt-pointed) is threaded, and the end drawn about three inches through the eye, and folded back on the thread. This folding is rolled and waxed right up to the needle, but the needle is not waxed; a little gets on, but must not stick to the steel, as the fingers are used to clear off any particle of wax at once; the draw of waxing is done just the reverse way at this folding, being *from* the needle always, and not towards the point. So as to keep the fingers clean for free working, a small piece of soft leather, about ¾ in. by 1½ in., is folded, and in the nip of the finger and thumb of either hand rubbed up and down the wax-end, even up to the needle eye, without fear of shifting the folded end. When done, it should be round, firm, and smooth as a violin string. To prevent it sticking together when rolled into a loop of about 6 in. diameter, tallow the fingers, and lightly surface the wax-thread with tallow. This is sometimes done before using the thread at work. In this state it may be packed away for use at any time.

Diagram illustrating Method of making Wax-Ends.

Now a parting word may be said to show why I have explained fully how to make a wax-end. WORK goes to such places as on board ship, out on the pampas of Buenos Ayres, the Cape, Australia, and New Zealand, for I send my copies, when read, to those parts; so that such information is of value where a shoemaker could not be found at once to tell how to make a wax-end, where, perhaps, the settler beats the "Phormium Tenax" into fibre, or the herdsman the "Ramee" to repair his boots or saddle. He might like to know how he may best make a wax-end, by using any gum near at hand for wax, and perhaps feel glad that WORK is not written above his wants — the fault of most practical, but out-of-reach-knowledge, publications; whose managers need reminding that the millions want to learn about time and life-pressed wants, although they admit, in the words of Ernest Jones, the poet of work—

"We plough and sow—we're so very, very low,
That we delve in the dirty clay;
'Till we bless the plain with the golden grain,
And the vale with fragrant hay.'

CHIP CARVING:

ITS APPLICATION TO DECORATIVE PURPOSES.

BY M. E. REEKS,

School of Wood Carving, South Kensington.

FIGS. 1 and 2 show decoration suitable to a shelf of a bookcase; they are essentially horizontal treatments. Fig. 1 is very simple, and does not require much explanation as to its setting out; the line round the semicircles should be marked in with the veiner. The centres, where necessary, are marked × and lettered C. The student, of

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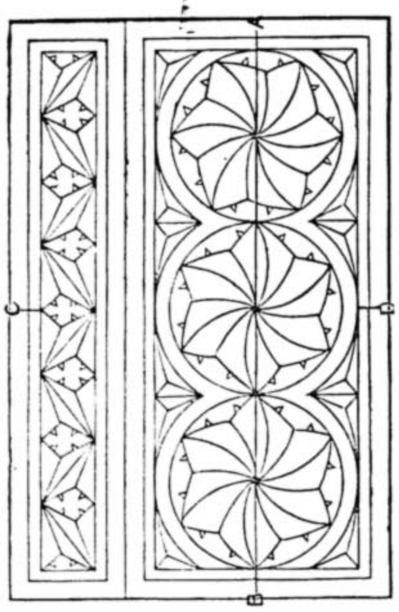

Fig. 4.—End of Box.

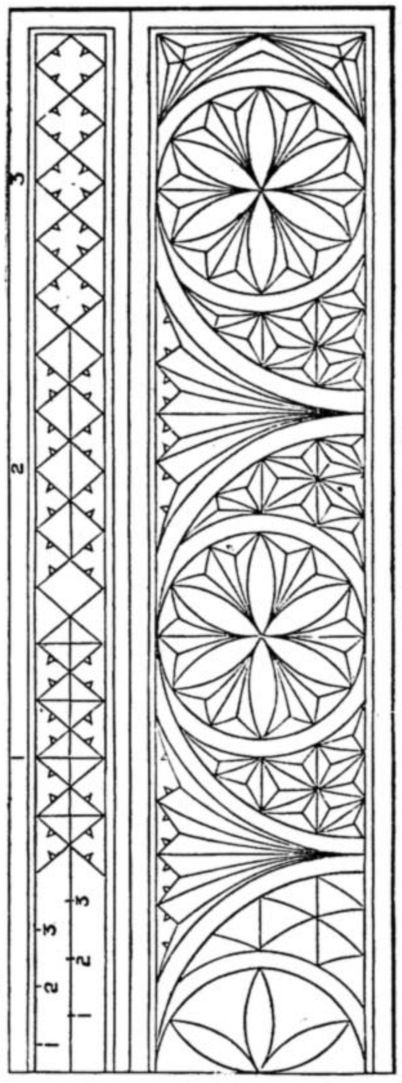

Fig. 5.—Half of Front of Box.

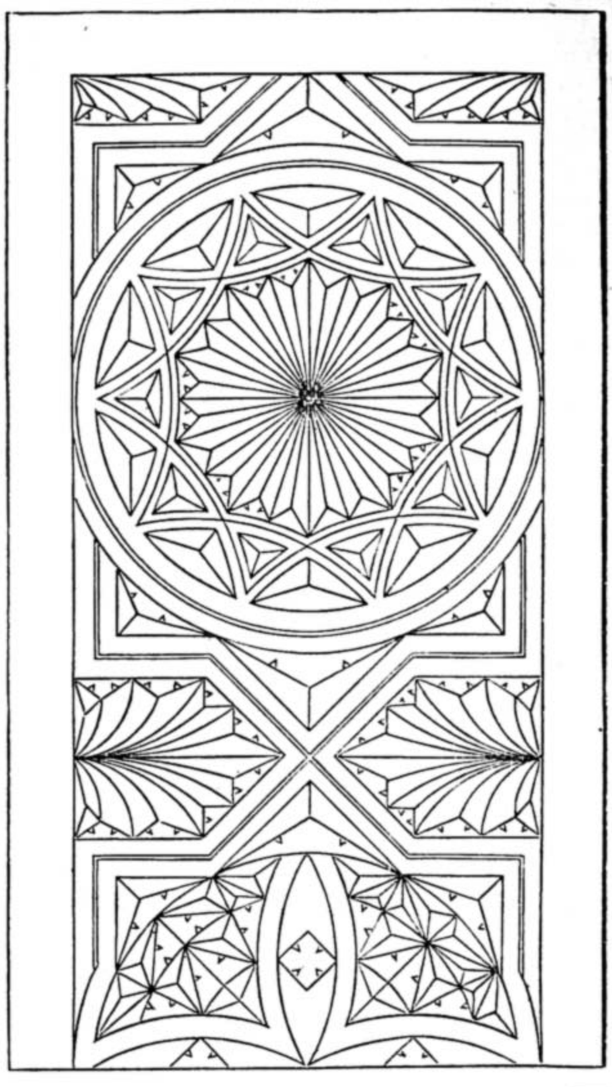

Fig. 6.—Half of Top of Box.

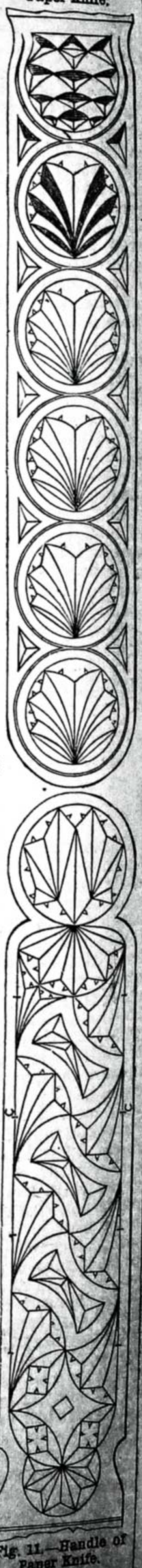

Fig. 10.—Handle of Paper Knife.

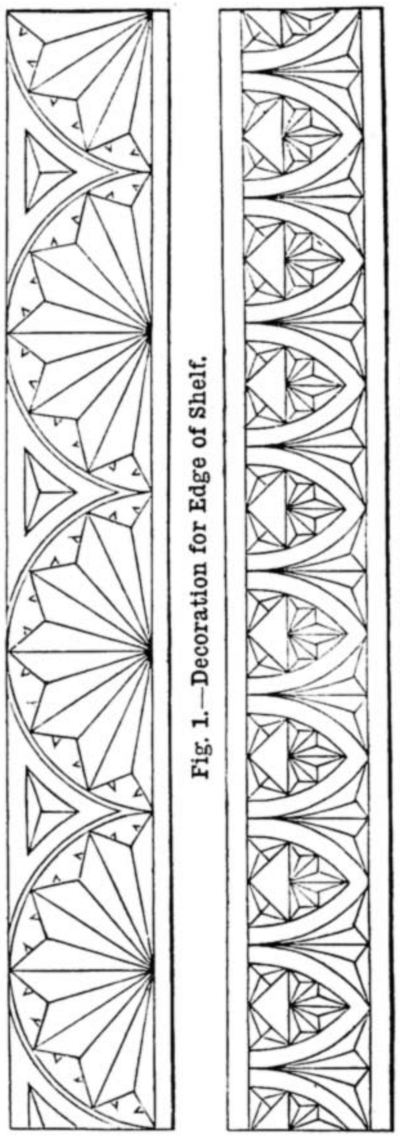

Fig. 1.—Decoration for Edge of Shelf.

Fig. 2.—Decoration for Edge of Shelf.

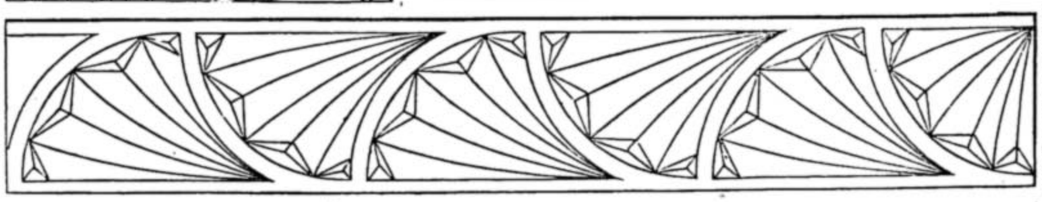

Fig. 3.—Decoration for Edge of Standard of Shelves.

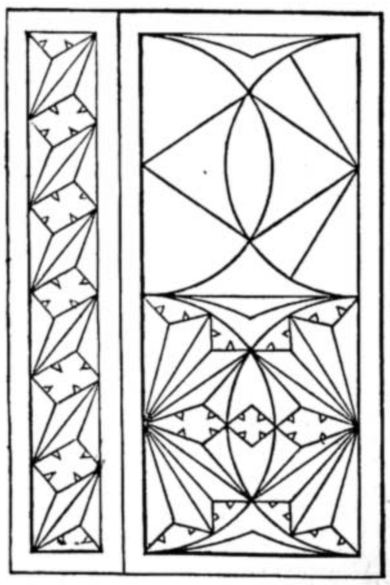

Fig. 7.—End of Box.

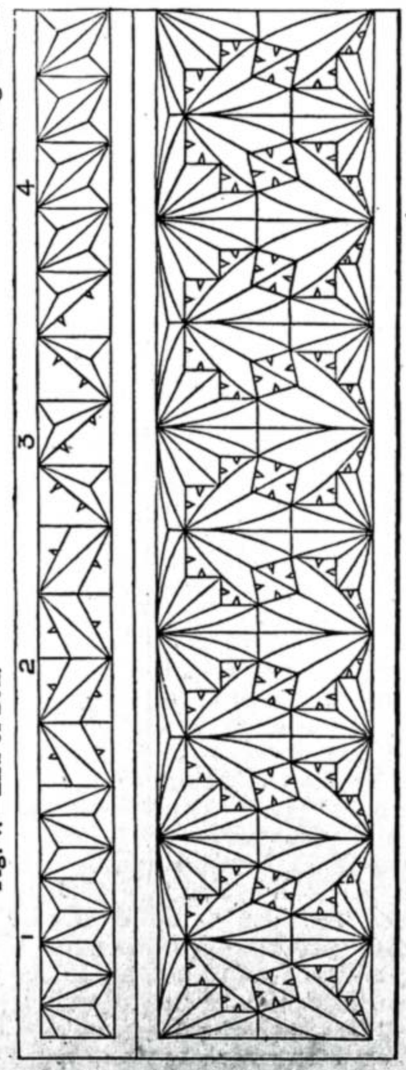

Fig. 8.—Half of Front of Box.

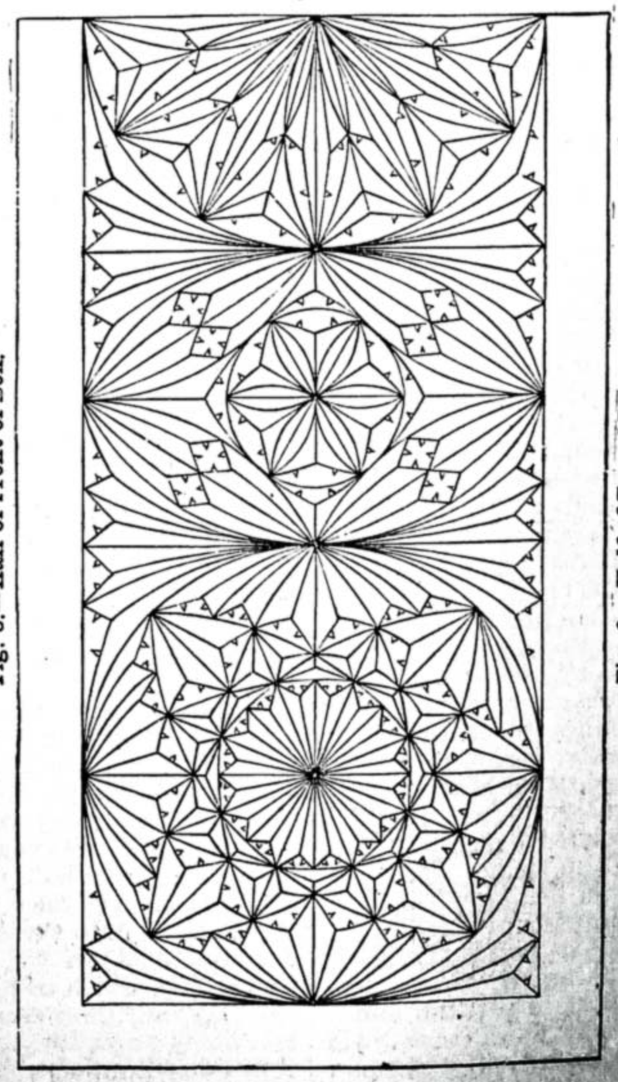

Fig. 9.—Half of Top of Box.

Fig. 11.—Handle of Paper Knife.

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course, must fit in the pattern to the length of the shelf. This is easily done by finding the centre of the shelf. Supposing the shelf to be 2 ft. in length, the centre line would be 1 ft. from either end. On this line will fall the centre of the semicircle; then describe the others on both sides until you reach about half an inch from the end; and if there is no room to finish with a semicircle, as at B in Fig. 12, or with the quarter as at A, the space must be filled up with what are known by chip carvers as "fans," which can be made to fill any sized space, as in Fig. 12 at C. The small triangular spaces are left in the surface of the wood, with little nicks cut out on each side.

Fig. 2 is set out as at D, in Fig. 12—triangles—the parts marked X, X, being left solid. All that has been said about starting from the centre of the shelf and finishing at its ends, in Fig. 1, applies equally to this pattern. Both these patterns would look just as well turned the other way up; I mean the points of the equilateral triangles being up instead of down, as shown at E in Fig. 12.

Fig. 3 shows a decoration suitable to a vertical treatment, though it may also be used horizontally. At F in Fig. 12, I ridge in the centre. In Fig. 3 the squares in the centre are solid, and the upper and lower sets of triangles sloped down to them.

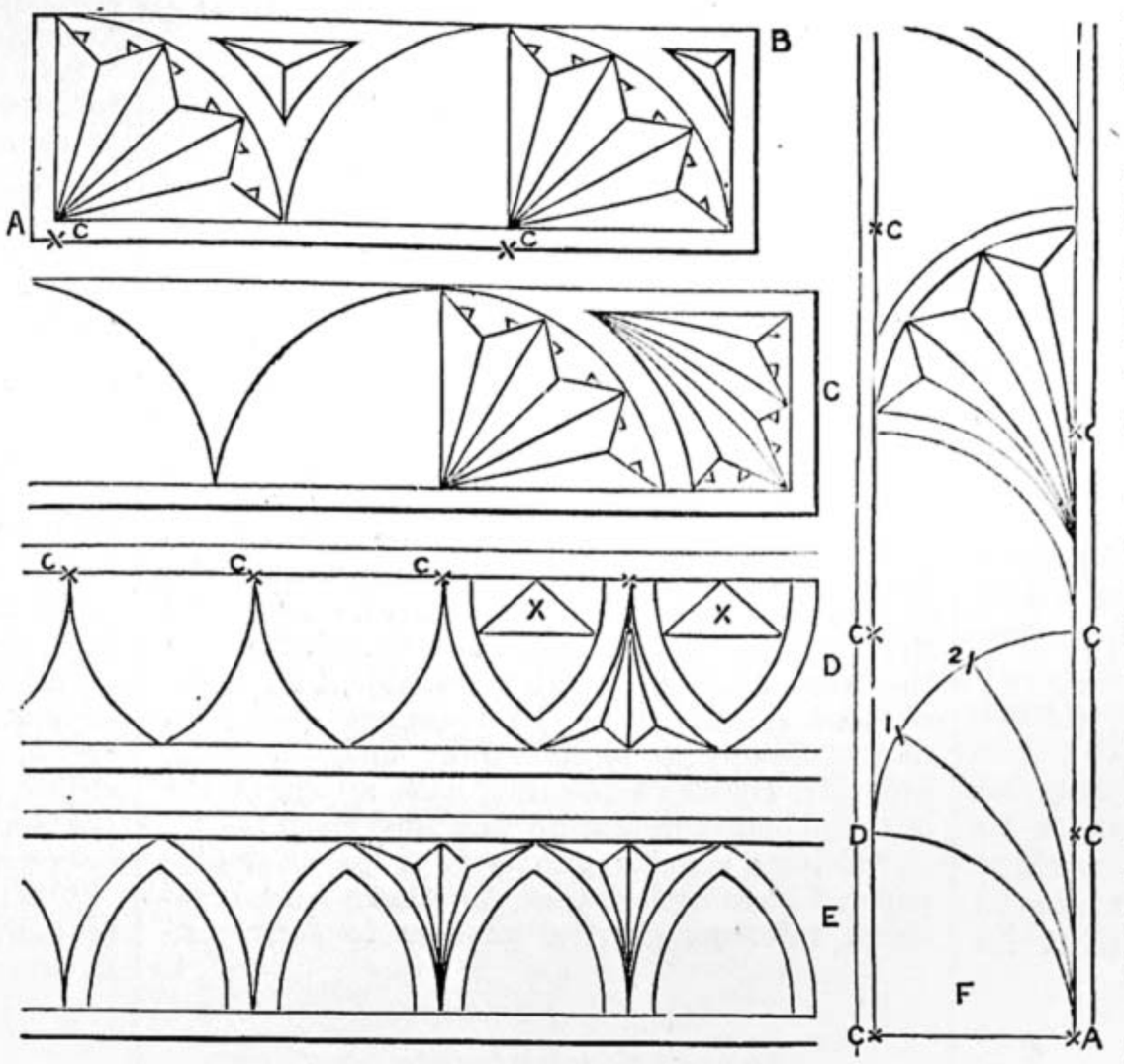

Fig. 12.—Exemplification of Modes of Setting Out Figs. 1, 2, and 3.

In setting out the pattern on the side, start from the centre of the box.

Fig. 8 shows a treatment for the front of a box where no plain bands are left; but I think this is not so good in effect. The setting out needs no explanation, being simply a series of semicircles interlacing with little solid triangles and squares.

Fig. 7 is another design for the end of a long box, or for all the sides of a small box. One half is left without putting in the detail, and shows the way to set out the pattern.

In Figs. 6 and 9, which, I may add, exhibit decorative work in chip carving for the tops of boxes, two ways of treatment are shown; that in Fig. 6 being with plain bands, and that in Fig. 9 without any bands at all. As they are both somewhat elaborate, I give in Figs. 13 and 14 the best method of setting out the principal parts of the design shown in Fig. 9, and in Figs. 15 and 16 the mode of setting out the leading features of the design given in Fig. 6. Fig. 13 is founded on an octagon or eight-sided figure, and exhibits the ornamentation of the circle to the left in Fig. 9. Fig. 14 is based on a hexagon, or, I may say, on a dodecagon or twelve-sided figure,

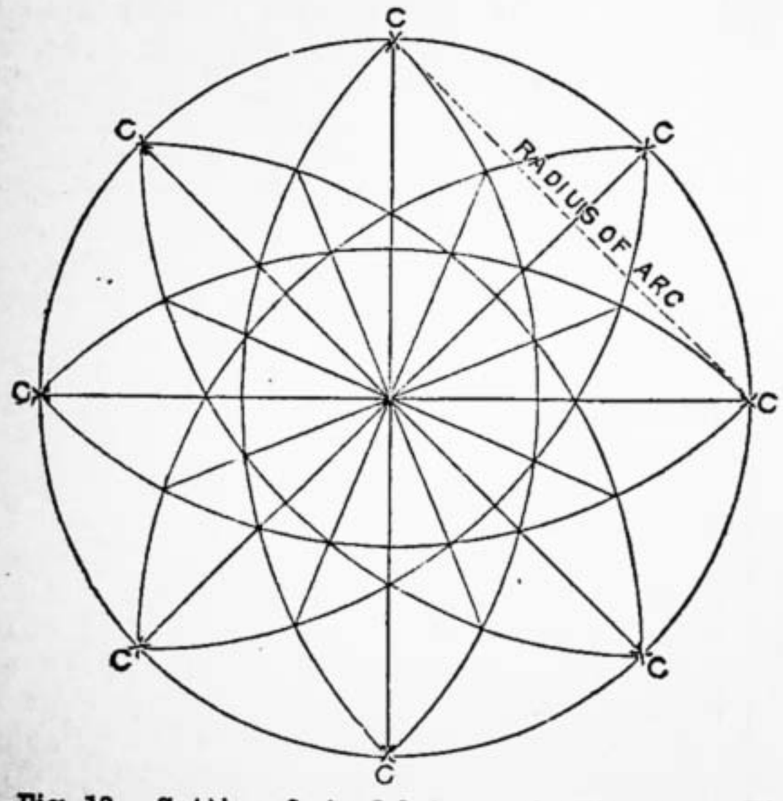

Fig. 13.—Setting Out of Octagon in Fig. 9.

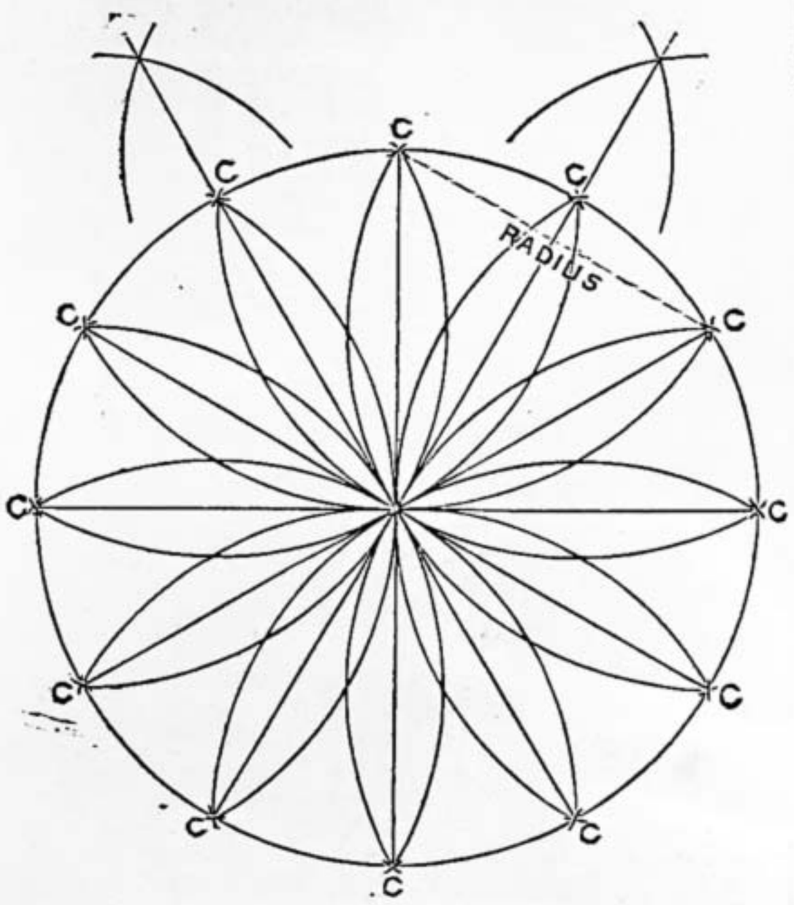

Fig. 14.—Setting Out of Double Hexagon in Fig. 9.

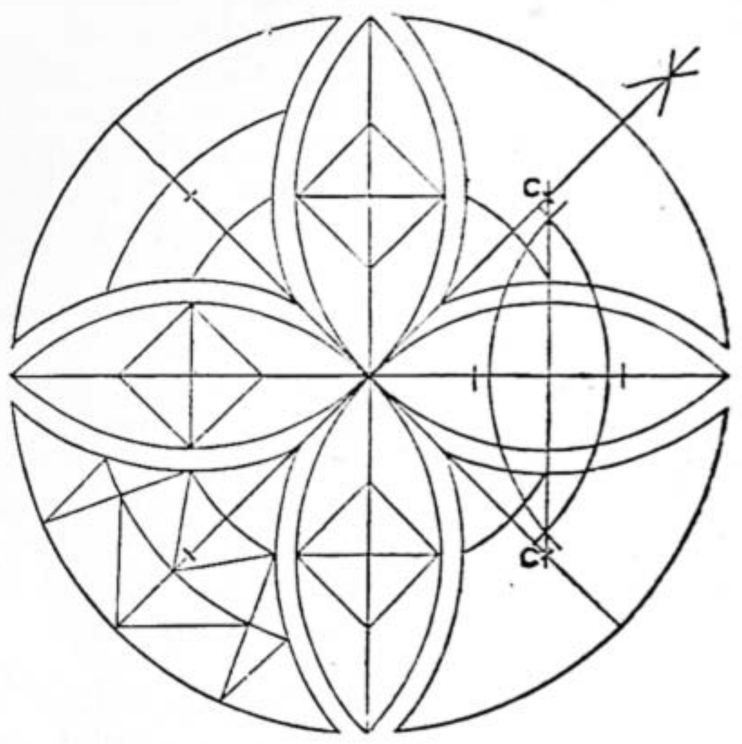

Fig. 15.—Setting Out of Quatrefoil in Fig. 6.

give the skeleton or working lines, and, in this case, it will be better to start the setting out from the end instead of the centre, and make the last fan either slightly longer or shorter than the others, if the space needs it. Describe the quarter-circles, then, with the same radius from the marked C X, and inserts points 1 and 2. The lines must then be drawn in by freehand from these points to their meeting-point, A. In this pattern the small triangles may be left solid with the little "nicks" taken out of the side, or else cut into pockets as shown in the pattern.

Fig. 4 is the end of a box. It requires nothing further to be said about it, except that it should be started from the centre lines of the box, viz., A B and C D, and that the circles should be divided into six by the method shown in my first paper.

Fig. 5 shows the long side of a box. Patterns 1, 2, 3 on the border of the lid show three different patterns which are all set out on the same lines; in No. 1, the upper and lower triangles being solid, and the centre one sloped towards them, leaving two ridges. No. 2 has only one

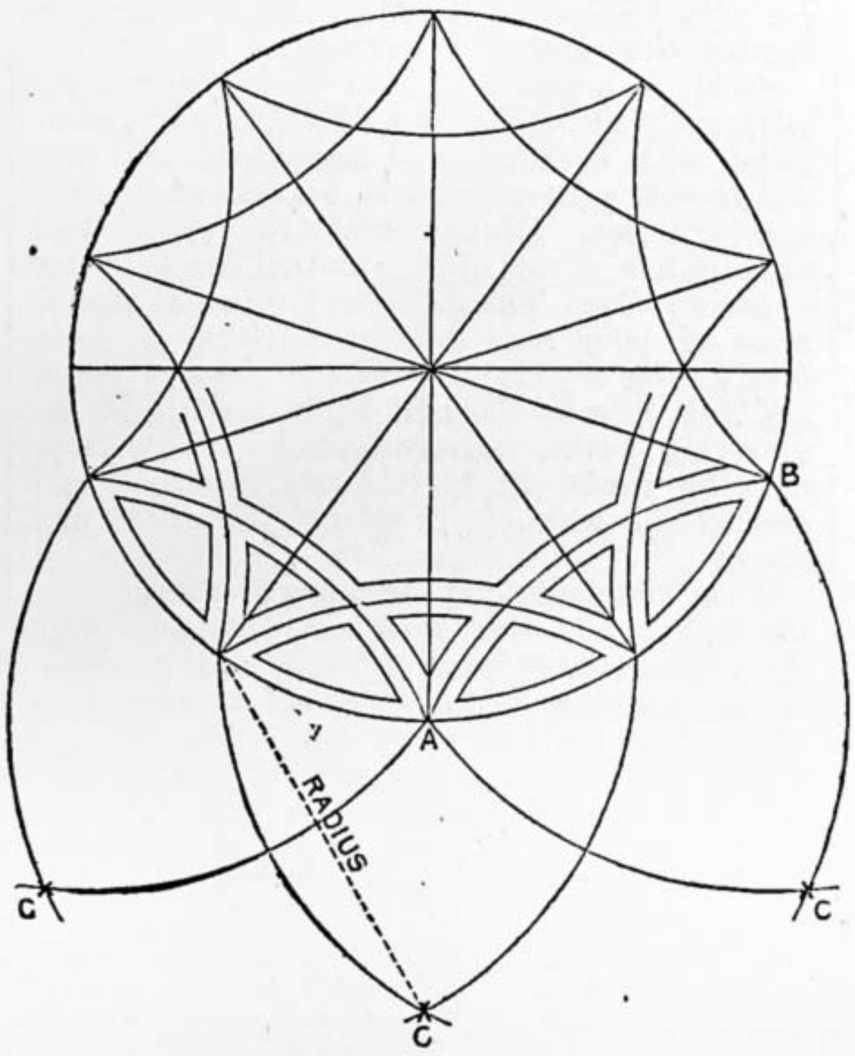

Fig. 16.—Setting Out of Double Pentagon in Fig. 6.

and shows the principle of setting out the ornamentation of the semicircle to the extreme right in Fig. 9, which, indeed, when repeated, would form the central part of the *whole* design for the top of the box. Fig. 15 shows the setting out of the quatrefoil, the half of which is shown to the extreme left in the design for ornamenting the top of a box, as shown in Fig. 6, and Fig. 16 the setting out of the decagon or double pentagon shown in the complete circle to the right of the design in Fig. 6. Both the quatrefoil and the pentagon or decagon, call it which you will, have plain bands. But the bands of the quatrefoil are left without any marking whatever, and those of the pentagonal design have a vein or line running along the centre of the bands, and taken out with the veining tool.

In these elaborate patterns, after ruling the centre lines on the boxes themselves, it will be well to set out the patterns on paper (as in the case of the pentagon here shown, the centres of some of the arcs come far from the figure itself, and cannot be found on the box), then measure off the points required from the paper on to the

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wood, and trace the curves, as A B, from centre C X in lower right hand corner of Fig. 16, on to a little piece of tracing paper with a black pencil, and then, reversing the paper so as to get the pencil side on the wood, go very carefully over the curves with a pointer or tracer; but, whenever possible, get the centres on the wood so as to do the arcs with compasses. Use the method described in my first paper for constructing the pentagon. The star in the centre of this pentagon is a decagon or ten-pointed one; this is obtained by dividing the pentagonal divisions into two.

Figs. 10 and 11 are paper-knife handles. They would very well bear being worked to a larger scale. Fig. 10 is quite simple, and needs no explanation; and Fig. 11 also, though it looks more elaborate, is easily set out, as I have worked the centres for the arcs.

I have now said all that is necessary to enable any reader of WORK who wishes to follow up this desirable method of surface decoration to do so with satisfaction to himself, and, I trust, to all to whom he submits his work.

MEANS, MODES, AND METHODS.

CEMENT FOR AQUARIUM.

SOME few months ago I required a simple and inexpensive cement for the inside of a combination fern-case and aquarium. Putty and red lead, separately or in combination, I resolved, from experience, to avoid, because, though they are often recommended by workmen who probably know of no other cementing medium, they are more suitable for external work, and are injurious—at first, at any rate—to the fish or other inmates of an aquarium. Pitch I had used, but found that in hot rooms it was apt to run a little, and that when under water it soon got foul, and tainted the water, to the detriment of the fish.

Then I remembered having seen somewhere or other a recipe for cement, the details of which I had forgotten to jot down. Not knowing the exact proportions of the ingredients, I experimented first, using *quantum sufficit* (as the old recipes put it) of each, and the result, to my surprise, was a success.

Into a medium-sized saucepan that had been discarded by the cook I broke up about ½ lb. of common resin, and when melted, stirred in about three tablespoonfuls of plaster of Paris, and finally one and a half tablespoonfuls of linseed oil. (My own impression now is that the original recipe said boiled oil, but the cement as given above did for my purpose very well, and as such I give it for what it is worth to readers of WORK.) When it was all quite fluid, I tried some, and found that it set almost at once.

For stirring it, a piece of stick or a wooden spoon is best, as a common kitchen spoon which I used in my first boiling disappeared entirely except the handle, and was absorbed or assimilated into the cement without leaving any trace.

This cement would do admirably, in my opinion, for sealing up pickle bottles, ink bottles, and Leclanché cells. I have used it for stopping up knot-holes in wood, mixed with sawdust of the wood in question to colour it, and when mixed with coarsely-broken bottles, for stopping up rat-holes; also as a temporary cement for water-cans and pails that have sprung a leak and cannot be repaired on the spot.

H. J. L. J. MASSÉ.

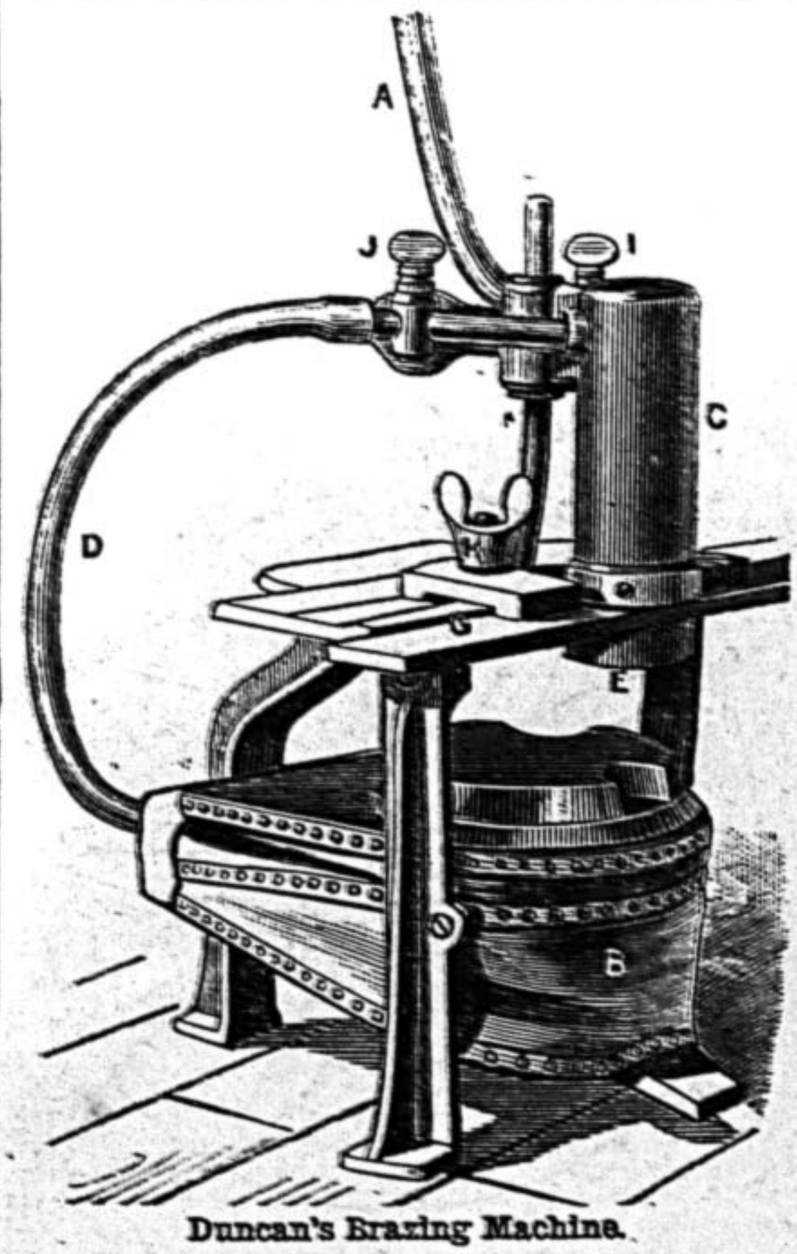
OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

58.—DUNCAN'S BRAZING MACHINE.

I HAVE much pleasure in inserting the following communication from Mr. Thomas Duncan, 305, Manchester Street, Oldham. I have no doubt that the machine itself is good and useful, and that the work done by its aid is reliable, but, being without experience of it, I cannot offer positive testimony as to its value: and, therefore, give Mr. Duncan's remarks, with an engraving of the photograph that accompanied them:—

"Being a regular purchaser of your valuable paper, I have noticed that there have been occasional references in the answers to correspon-



Duncan's Brazing Machine.

dents in 'Shop' to the old method of brazing band saws by means of the tongs.

"This is a process at once producing bad results, and one which is wasteful of time, compared with the process I have invented, and which, with your permission, I wish to introduce to your notice. I believe that a reference to this machine in that part of your journal entitled 'Our Guide to Good Things' would prove of use to some of your numerous subscribers. I have been selling the machine for the last five years, and it is now in constant use in the largest engineering works, railway carriage works, shipbuilding yards, etc., in England, Scotland, and Ireland, in which it is saving both time and money.

"The simplicity and certainty of the process, the economy of time it effects, combined with the comparatively small price of the machine, render it a most valuable adjunct in any workshop where band saws are used. The price of the machine is 28s. I can forward on a machine for your inspection should you wish it, but I believe that the enclosed photograph and the following description of method of working will be sufficient.

"Connect the machine with a gaspipe by the rubber tube marked A in photo. The tube D conveys air from bellows B to burner C.

"Fill the recess E under burner with pieces of unslaked lime or asbestos.

"The two ends of the saw are to be prepared in the usual manner (mentioned by your correspondents), filing them and overlapping two teeth. Wrap the overlap tightly with fine iron wire, overlaying the same with fine brass wire, and with a coat of water and borax the saw is ready. Place it on machine with the joining under burner, the back edge close against the planed edge of machine G, so that the saw will be straight when brazed; place the two clips on it and secure with thumbscrews K.

"Turn on gas by tap attached to burner, apply light under it, and fill the bellows with air, admitting it gradually to burner by the other tap J. The object now must be to obtain a white heat on the lime or asbestos, and it is most important that neither more nor less gas is used than is required to combine with the air in the burner. If there be too much gas the flame will spread outside under the burner, in which case reduce it gradually until a white heat is seen on the lime or asbestos. A greater quantity of gas does not produce a greater heat.

"With a little practice a man need not be more than ten minutes after breaking a saw and having it ready for work again."

59.—SOME USEFUL BOOKS, PRICE LISTS, ETC.

I must endeavour to mention some of the books and price lists, which, if books had eyes, would be looking reproachfully at me from the position they now occupy on my study table. Space, unhappily, by the want of it, prevents in any and every case any lengthened notice.

(1) **"International Annual of Anthony's Photographic Bulletin."**—A charming volume in paper cover, containing 490 pages of text, comprising several short articles on a great variety of subjects connected with photography, 156 pages of advertisements, a "Portrait Study" by C. F. Conly (printed on N.P.A. extra brilliant albumen paper), and about twenty plates by various processes from negatives by well-known photographic artists, besides numerous wood engravings in the text, of which the best to my mind is "Bellagio," by the Collotype process. And all for 2s.! It is an American production, but the London publishers, if I may call them so, are Messrs. Iliffe & Son, 3, St. Bride Street, London, E.C.

(2) **"Encyclopædia of Photography."**—Messrs. Iliffe & Son also send Parts 1 and 2 of "The Encyclopædia of Photography," by Walter E. Woodbury, published at 6d. It will contain, it is said, over 1,000 references, and be illustrated with above 200 explanatory sketches and diagrams by the author. Judging from the parts already published, the "Encyclopædia of Photography" will be a most useful vade-mecum and book of reference for photographers when completed.

(3) **"Lights."**—This is an introduction to the science of optics, designed for the use of students of architecture, engineering, and other applied sciences, by Mr. E. Wyndham Tarn, M.A. architect, and author of various works on building, geometry, etc. It is clearly written, and illustrated whenever necessary by carefully-executed diagrams. It forms a volume of "Weale's Rudimentary Series," and is published at 1s. 6d. by Messrs. Crosby Lockwood & Co., Stationers' Hall Court, London, E.C.

(4) **"The Practical Patentee."**—A monthly journal for inventors, etc., at 1d., published by Mr. E. W. Allen, 4, Ave Maria Lane, London, E.C. I cordially recommend it to the notice of all correspondents of WORK who have written or are going to write to me about inventions, patents, and patenting, etc.

(5) **Messrs. Grimshaw and Baxter's Price List.**—I have received from Messrs. Grimshaw and Baxter, 33 and 35, Goswell Road, London E.C., a useful descriptive price list of lathes, tools, machines, stocks and dies, and other appliances kept by them at their General Mechanics' Lathe, Tool, File, and Material Warehouse, at the above address. It will be found useful by machinists, as many machines and appliances not to be found in ordinary tool-dealers' price lists are here mentioned and priced.

THE EDITOR.

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SHOP:

A Corner for Those who Want to Talk It.

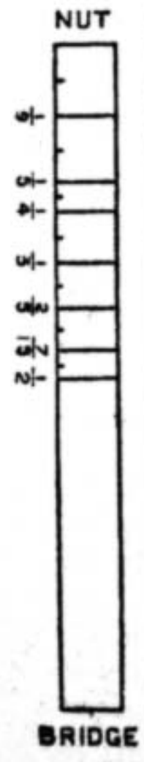
NOTICE TO CORRESPONDENTS.

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

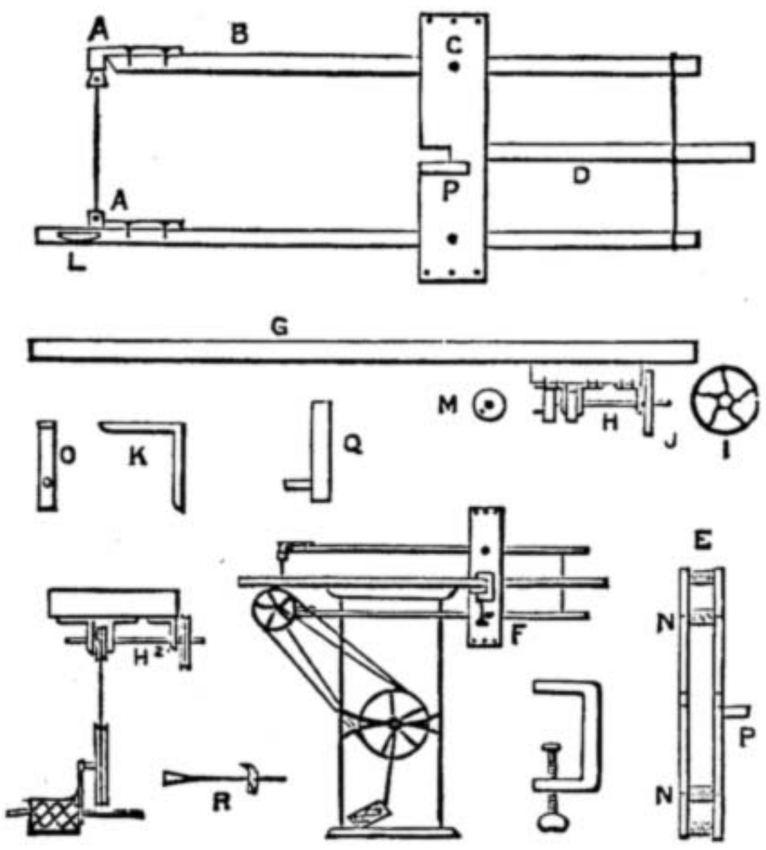
I.—Letters from Correspondents.

Sheet Metal Work Book. — ALIQUANDO writes:—"TINKER (see WORK, p. 191, Vol. II.) must not put to me words I did not use. I did not say Warn's book was 'practically useless.' On the contrary it has done excellent service in its day, and TINKER himself speaks of the immense benefit it has been to him. But if his run of work had been of much variety, he would certainly have himself discovered some of the deficiencies, errors, and impossibilities of the book, its general slovenliness, and the entire absence of principles in it. On page 9 Warn shows how to get the pattern for a flue article (frustum of cone, not 'frustrum' as Warn always has it), when top and bottom diameters and height are given; he does not, however, show how to draw the pattern when the height is not given, but instead, as is usual, the flue. In enunciating his problems, Warn's enunciations are general; yet he takes always a particular case, and his constructions will not apply generally. Take, for instance, and almost at random, the tapering oval body, of page 19, the hip bath, of page 53, and the sitz bath, of page 55. In the two latter there is this assumption, that the ends and sides, if produced, must meet in one point. TINKER should get a hip and sitz bath, turn them upside down, and note if the sides and ends, produced, will meet in one point; he can then judge if these baths of all sizes will do so. In the case of the rectangular tapering top, or tray (or hood), of page 23, though each side may in practice be at a different angle with the horizontal plane, these angles, according to Warn, must be one and the same. In the pattern for a tapering piece of pipe, on page 33, elevation lines are used as if they were true lengths, entirely falsifying the construction. The case of two cylinders at an oblique angle, of page 35, has been dealt with fully by myself and others in the *English Mechanic*; to its pages I must refer TINKER (March to June, 1889). Again taking up the tapering oval body, of page 19, this is a body formed of two equal portions of oblique cone frusta (see Millis's 'Metal Plate Work, its Patterns, and their Geometry,' pp. 168-9), and as the pattern for the frustum of an oblique cone cannot be formed of arcs of circles, Warn must be wrong. In all unequal tapering bodies, such, for example, as bath patterns, tea bottle and canister tops, if the radii of the arcs forming any portion of the tops and bottom are equal, Warn's methods do not apply. And in tapering bodies, equal or unequal, where the sizes of top and bottom approximate at all, Warn is utterly useless, for his centres would be in the next shop, or street, or town; he has no short radii methods whatever. Millis uniformly gives these methods. TINKER must not suppose I have supplied him with an exhaustive catalogue of Warn's 'numerous errors,' for, as per his request, I have only pointed out a few. But if he wishes it, and our Editor can afford the space, I will go fully into any one that TINKER may select of the problems which I have here either directly or indirectly indicated, as the matter of accurately striking patterns in metal plate affects a very large body of working men. This reply of mine to TINKER concerns G. J. P. (*Manchester*), who (WORK, June 21, p. 223) has inquired as to a tinman's pattern book, and PLUMBER (*Slade*) (WORK, June 21, p. 225)."

How to Fret a Banjo. — F. H. (*Streatham*) writes:—"I am not saying that J. G. W. (see Vol. II., page 292) is not right in dividing the neck of the banjo into eighteenths, but a banjo so fretted would not sound the correct notes; and after what the Editor essayed on page 287, 'Means, Modes, and Methods,' I take the liberty to offer my method to find the right distances of the frets. Take a strip of paper the exact length from the nut to the bridge, and about an inch wide; fold it in half, and mark the distance of ½ on the neck of the banjo, and then fold the length of paper in three, and mark off from the nut ⅓, and if you fold one third into three it will give you the ninths; mark off from the nut ⅑; fold the paper again into four, and mark off ¼, and with a little trouble, you can fold it into five, and then mark off ⅕ and ⅖, then fold one fifth into three and it will be a fifteenth, mark off 1/15; the diagram will give you the right distances as I have marked below. Divide the other half of the neck in the same way, and divide between these marks, and it will give the half tones near enough."



Fret Machine.—J. A. C. (*Plaistow*) writes:—"I have seen a good many designs for fret machines in 'Shop,' but I think mine beats them all, although those in 'Shop' are very ingenious. I am only an amateur myself; I have tried to draw out a design of a fret machine I made myself; the design is entirely my own invention. I bought a sewing machine bottom and made a top to it—cost 1s. 6d. A are the clamps I bought; B, the arms, are made of ash (I made them myself; also C, which is common deal). D, stretcher; E gives a front view of C; G, machine top; H, gear to drive the arms; I, front view of small fly-wheel; J, side view; K, a bracket, of which I had three, for bearings; L is a piece cut out of the arm that works under the table (see Q),



Fret Machine and Parts.

side view; M, front view; O, front of K; F, machine ready for action; P is a side piece I screwed on to C, to hold the same to table, G, with clamp; N N are pins for arms to work on. I can unscrew M from bearings (which is an oak bung of a barrel with a nut let in), and, taken off the table, an ordinary table is produced. When I can afford it, I shall make it a turning machine; I have only to fix the turning gear on top of the table, without disturbing the machinery below. H² is the works under the table; it shows more plainly Q, which causes the up and down motions of the arms; R, bit for drilling. Now as to cost of this machine. I bought the bottom of the machine for 1s. 6d., which I don't suppose can be had very often at the price, but I should think it could for about 4s. or 5s.; the woodwork, say it cost me at the most 3s., makes 4s. 6d., and bearings and saw clamps a friend of mine made me for 4s. 6d.; total 9s. I have got a good substantial machine, convertible into fret-turning, drilling, grinding, and a table."

II.—Questions Answered by Editor and Staff.

Clock Faces.—GOLDRIL.—The dials you mention are, I believe, electro plated in a great many cases; in others, treated with nitrate of silver, the fine surface being got up in a lathe; or in some cases, called in the trade engine turned, then plated or silvered; others are polished, then dipped in the acid bath as for lacquering, then silvered. You might get a good mat surface on your copper dial by *breaking* a rod of iron, say, about ¾ in. diameter, and case-harden the broken end, and, using that as a punch, well hammer all over the surface; then silver it and varnish it.—A. B. C.

Battery for Electric Scarf Pin.—J. C. (*Newcastle-on-Tyne*).—A small dry battery, suitable for this purpose, was described on page 748, Vol. I., of WORK, in reply to ASCA (*Newcastle-on-Tyne*). The number in which it appeared is No. 47, published on February 8th, 1890. I shall have something to say on pocket accumulators for this purpose in my forthcoming articles on "Model Electric Lights."—G. E. B.

Making a Patented Article for Private Use.—NOLI inquires whether he may make a patented article, not for sale, but for use in his own business. Without professing to give an opinion on a point of law, which is out of our province, we think that on consideration he must see that he cannot do this without injuring the patentee. If he may make one article, there can be no reason why he should not make more than one. Every man who makes a patented article lessens the market of the patentee by one. If every man made the article for himself, the patentee would have no market whatever. No man may do that which injures the property of another; and for every wrong, English law is supposed to have a remedy.—C. C. C.

Metal Plate Pickling. — J. W. (*Ashton-under-Lyne*). — I never heard of such a book. The only pickling of metal plates with which I am acquainted is that practised in the tin plate works, in dilute hydrochloric or sulphuric acids. You appear to be acquainted with this, as you mention spirits of salts. But if not you can find the method described in Percy's "Metallurgy," page 726, Bloxam's "Metals," page 265, or any standard work on metallurgy.—J.

Casting Zinc Rods.—ZINC RODS.—You can make the mould out of a piece of gas barrel split in two equal parts by means of a hacksaw or slitting file. File the insides smooth and smear them with tallow, then coat with blacklead; bind the two halves together with wire. Plug up the lower end with clay, and in this insert the copper connecting wire to be cast in the rod. Melt the zinc in a plumbago or a fireclay crucible, and flux it with resin; stir up with a green stick, and skim off all dross before pouring the hot metal into the mould. This should be made very warm before the metal is poured into it. If you follow these instructions your rods will not crumble.—G. E. B.

Gesso Work.—A. S. T. (*Bishopsgate*).—A second article on this subject appeared in WORK, No. 41; this apparently has escaped your notice. The third you have already seen, and a fourth and concluding one appeared in No. 52. If you follow the directions given I think you will find there is no difficulty left unsolved even for beginners. Buy two tins of gesso composition and liquid at the Society of Artists' Studio, 53, New Bond Street. Directions for mixing are on the tins. After a trial, if you find you require any further explanations I shall be pleased to answer any questions you send.—E. C.

Dulcimer Strings.—ANXIOUS.—The dimensions you give for a dulcimer would be those of a C instrument, and would require stringing with Nos. 10 and 9 brass, and 9 and 8 steel wire. No. 10 would be used for the first six notes, remainder No. 9 brass; No. 9 steel for the first six notes, remainder No. 8. No special music is written for the dulcimer, any that lies in a fairly easy key being playable by ordinary performers and almost anything by skilled ones.—R. F.

Tyre Cement.—W. E. R. (*Southgate*).—I have not a good recipe for cycle tyre cement, neither would I care to make it though I had. Good tyre cement is to be had of all the cycle makers and dealers, at a shilling a pound. W. E. R. might make it a little cheaper, but the mess would not be worth the trouble unless he were going to make it to sell. Any of the London cycle dealers will sell it. I get mine from W. A. Lloyd & Co., Birmingham.—A. S. P.

Bookbinders' Materials.—G. L. (*Sheffield*).—Regarding the above I have received the following: "Bookbinders' materials, a skin or two of leather, 5 or 6 lbs. of millboards. Head band, marble. Paper, thread, etc." Signed G. L., written on a scrap of paper 4 in. by 4½ in., perforated at one side and numbered 1 at the top left-hand side. Now I ask, in the name of common sense, what does the fellow mean? Has G. L. mistaken WORK for a funny paper, and sent the above as a contribution to the "Sphinx" column. I have never been very successful in solving enigmas or drop-letter words, so I will not make the least attempt to solve this, certainly a drop-word letter this time. If it is the prices of the above articles, I could easily give them if the information was asked for, or if I had the least chance of finding that it was wanted. I need not waste your space, Mr. Editor, in trying to solve the problem, I will simply give it up. There have been one or two grumbles over vague questions in your columns already, so I will say nothing more about the one before me. Just allow me to say, however, that it is a real pleasure to answer questions which are put in a pointed manner. If querists do not put their wants in a definite form, we cannot be expected to play the part of the clairvoyant, and give them definite answers. In the above Irving Bishop would have no chance.—G. C.

Bright Silver Plating.—W. C. (*Hornsey*).—A bright deposit of silver may be obtained by adding a solution of bisulphide of carbon to the plating solution, but this must be used by an experienced plater if immediate good results are to be desired. You must feel your way by experience before you can make sure of getting a bright deposit on any article placed in the solution. The small copper hooks may be plated tolerably bright by first paying attention to the preparatory polishing. Get them bright, and then only deposit a thin film of silver on them. A thick coat will be dull on leaving the vat, and must be polished afterwards. Unless I saw the hooks, I could not say whether it was practicable to polish them or not.—G. E. B.

Incandescent Electric Lamp. — ELECTRIC. — A complete illustrated description of an incandescent electric lamp was published on page 428, Vol. I., of WORK. There will be more about these to follow in due course of time. The lamps cost from 4s. 6d. to 5s. each, and can be had from any dealer in electrical sundries.—G. E. B.

Dog Kennel.—(*Coatbridge*).—The best kind of dog kennel is patented, so that to describe it would be useless. Surely if you can manage to do the necessary carpentering you do not require a description of such a simple thing as a dog kennel.—D. D.

Polish.—A. R. (*Gravesend*). — Get some good black stain, such as is used by French polishers. Stain the wood with it, and when dry the articles only require to be polished in the ordinary way. With small round articles you will get better results by polishing them while in the lathe. You cannot do better than use beech, though almost any kind of wood will do. Use up waste bits unless you have a great number of knobs, etc.—D. D.

Ebony Stain.—A. G. P. (*Hastings*).—You will find it much better to buy this than to attempt to make it, both on account of price and quality.

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However, if you wish to try proceed thus: Boil some logwood chips in water to make a strong decoction which must be applied warm to the work. To turn it black go over again with vinegar in which iron filings have been left for some time. The acid you allude to is probably hydrofluoric. Apply to any chemist for quotation.—D. D.

Water Motor. — W. H. H. (*Huddersfield*).—Messrs. Gwynne & Co., engineers, Hammersmith, London, may supply what you require.—F. C.

Frame-Making Tool. — READER. — What the trade usually use for frame making are: (1) Mitre-cutting block for roughly cutting the moulding at 45°, and tenon saw; (2) shooting-block and plane for planing the angles; (3) a vice, bradawls of various sizes, a hammer, glue pot, glue, and brads of all sizes. In regard to Booth's mitre-cutting machine, I have it, and find it a very good, compact machine: it does its work well, and dispenses with block and shooting, etc., as also the cramps: they have their good sides as well as faults. All sizes would be required, as a 4 in. cramp would not grip 1¼ in. stuff. Syer's patent also does its work admirably well. But, for to supply you your answer complete, and upon more practical judgment, I have been in two of our largest frame-making factories, where I saw from fifteen to twenty men joining up frames, and they all agreed nothing beats the old-fashioned blocks and vice as first above detailed. These men get paid so much per hundred frames, and they consider it a bad week if they do not each one make 700 to 800 frames, about 1 in. wide. You may with practice do the same with either tools, as what one likes best one can handle most dexterously and expeditiously.—G. R.

Books on Frame Making. — THEO. — I know of no book of complete instruction on picture framing, and all its branches; I think none exists. Practice with your tools would make great advance. For photo stands, try Houghton's, High Holborn, London.—G. R.

Mounting Velvet. — W. W. (*Elswick*). — The best method to mount velvet on cards:—Glue the card over with strained glue and a good brush, so that the hair does not come out; let it lay a second so that the glue does not get through the fabric if thin; lay stuff on card, and rub gently down the way of pile; then trim round centre and outside, and snip cuttings about half inch apart; then glue close round centre and outer edge, turn bit by bit over, and stick down. In fastening plate, either glue to rim or you can get some brass tags at ironmongers', which you could screw on by sticking a block of wood on reverse side, where screws would pierce; by this method plate can be removed at will.—G. R.

Steel Castings. — FREEMASON. — Try Samuel Osborne & Co., Clyde Steel Works, Sheffield, or Hadfield's, Hecla Works, Sheffield. But there is such a pressure of business just now that firms will not look at orders that they would accept at other slacker times. Even orders weighing in the aggregate several tons have to bide their time for execution. I do not know anything of the demon motor. Why not write to the advertiser?—J.

Tinplate Churn.—J. F. (*Elgin*).—I give you herewith sketches and dimensions of a churn that I think will suit you; it is exactly like one I made a few months ago for a dairyman, and it gives great satisfaction. You can, of course, vary the sizes to your liking. Fig. 1 shows a general view of it; you will see that it is D shaped, with a foot fixed on, flat cover, and cranked handle. To make it, proceed as follows: Take two 20 by 14 plates and square them up to 13¾ by 15, set your compasses to 6¾ in., and make a line 6¾ in. from one end of your stuff, and from this line describe an arc or semicircle; this will give you the shape of the sides. Mark them both exactly the same; notch the top corners the same as you would a saucepan for wiring, then turn up an edge all round (except the top) on both of these sides; now bend a strip of zinc round inside the edge just thrown up; this will give you the length to cut the body piece. I forget the exact length, but it is easily ascertained. This you will have to make in two pieces; they will be, as you see marked in sketch, 7 in. wide. Groove them together, and well and smoothly solder, bend round to shape and tack to one side; tack in several places, and then slip on the other side and tack that in the same way; then solder them all round, wire the top with about No. 9 wire, and the body is completed so far. The part that forms the foot will scarcely need much explanation to one in the trade; it is made in four pieces, wired round the bottom and soldered to the churn body. Make a rim for the cover 1¼ in. deep, and throw off an edge of ¼ in.; pane your cover on to it and solder all round inside, to prevent the cream getting between the rim and the cover. The wire of the body and the foot also would be all the better for being soldered round. Make a handle for the cover as shown, and let it be a good width and size, and solder it on; this handle will, when fixed on, materially stiffen the cover and assist in keeping it flat, as square covers like this have a tendency to wind or warp, as no doubt you are aware. This completes the description, with the exception of the dasher and spindle. To make the arms of the dasher you will want eight pieces of tin 1½ in. wide, and a little less than the diameter of the churn measured across the centre line, say 13 in.; now fold four of these pieces in the machine or on the hatchet stake as if you were going to wire them; then cut $\frac{1}{16}$ of an inch off the other four pieces and fold them in the same manner; they will then be just the size to slip in the other pieces, forming a kind of flat tube, as it were; make two of these and then halve out the other pieces to lap across them so as to make two crosses. Before forming any of these pieces, punch a $\frac{1}{16}$ in. hole through the centre of each piece for the spindle to go through, then solder all up and ram a little paper down each end, and solder the ends; be sure to get them water-tight. Then make eight similar pieces to connect the two crosses with—these need not be cut quite so wide; when made, fix them as shown in sketch, one about ¼ of an inch from the end of crosspieces, and the other 2 in. apart from it (see Fig. 2); all this must be fixed exactly square and true, or it will not work properly. Through the holes just mentioned slip a piece of tinned brass tube $\frac{1}{16}$ in. inside; let it project ¼ of an inch one side and solder just flush on the other side of dasher, and on the side where the tube is left flush solder a tinned brass or iron nut tapped $\frac{1}{16}$ in.; this nut should be ¼ in. thick, and you must so regulate the length of the short pieces connecting the two crosspieces, that the dasher, when fitted up as just described, will just slip easily between the sides of the body, so as to leave as little side play as possible. The bushes for the spindle to run in are the next consideration, as one

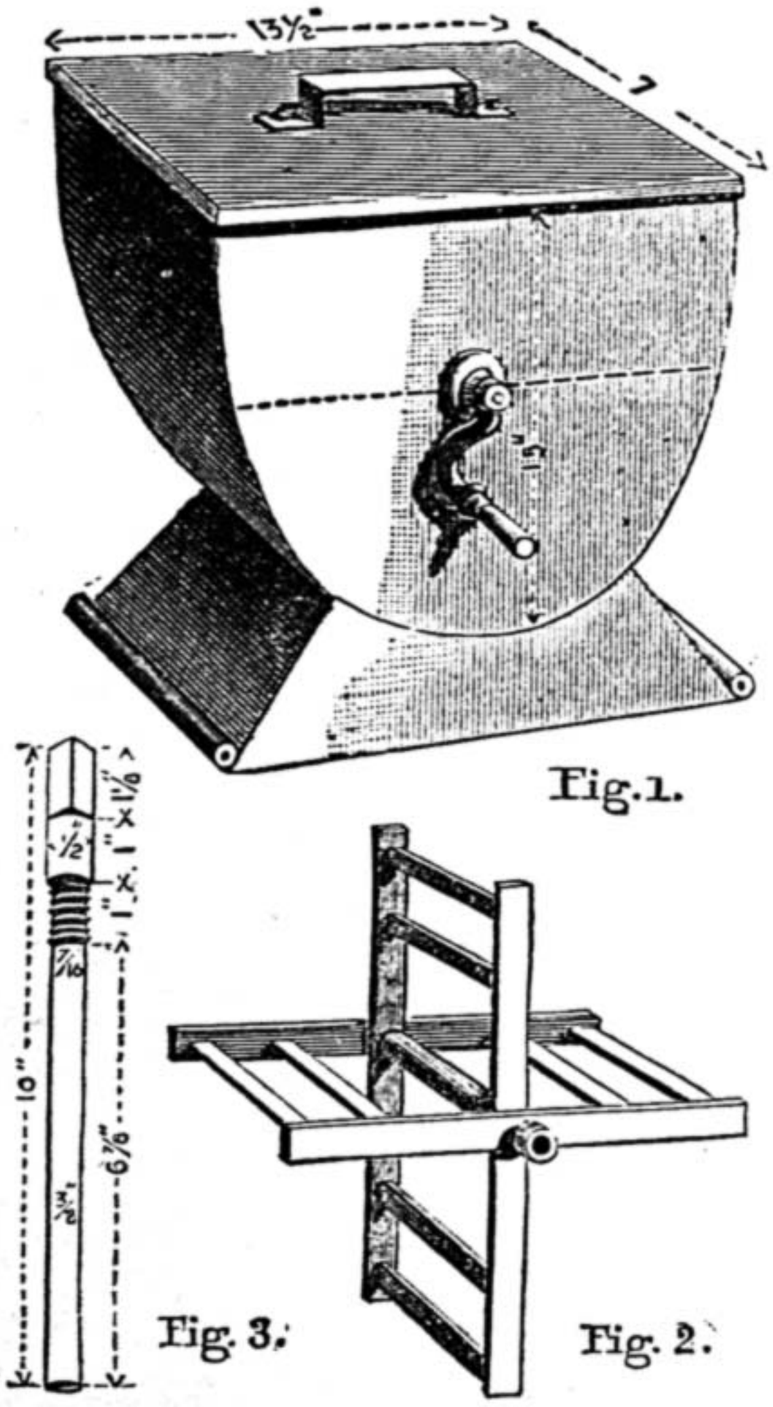

Fig. 1. Fig. 3. Fig. 2.

Fig. 1.—Churn. Fig. 2.—Churn Dasher. Fig. 3.—Churn Spindle.

end of the spindle will be ¾ in., and the other ½ in.; get two pieces of brass tube that will just allow those two sizes to slip in; a good fit must be made; it would be best to have it rather tight and grind in with emery powder. These pieces of brass tube need only be ¾ in. or ⅞ in. in length. Then take two pieces of sheet brass $\frac{1}{16}$ in. thick, cut two circles 2½ in. in diameter, and drill two holes in them, one for each size tube, and solder them in, letting them go ⅛ in. through the brass plate. Now make corresponding holes in the churn body—the centre mark where you struck out the body will be your guide; be very careful to get the holes exact or it will not work properly. Then fix the bushes in, the long part of the tube outwards of course, and solder round inside and out. Now the spindle: this should be cut 10 in. long out of ½ in. round iron; you will, I expect, have to get it made (see Fig. 3); let 6⅞ in. of it be turned down to ¾ in., 1 in. with a thread to fit the nut in the dasher; 1 in. to fit the largest bush, and the remainder squared up for the handle to fit on. The handle calls for no further remarks than that it may be fixed on by drilling a hole in the spindle after tapping it on lightly, and putting a pin through the hole. Both handle and spindle should be tinned. To set working, simply place the dasher in the churn, put the spindle through, wind it into the nut on the dasher till it comes to the shoulder at the end of the thread, when you will be able to turn it round. When done with, hold the dasher with an end, and unscrew the handle and spindle with the other. I hope this description is full and plain enough. I might have given more details, but must have some regard for the space in "Shop" and our Editor's request to be brief.—R. A.

Fixing Lamp.—PEEPING TOM.—I should not use a lamp in a workshop that had a glass reservoir for fear of accidents, especially if my hobby were wood working, as yours is. A good back lamp to hang on the wall with an inch burner can be bought for 1s. 6d. or less, but, in any case, you will want your reading lamp mended; so here is a cement that is said to be impermeable by petroleum or kerosene. Boil three parts of resin and one of caustic soda in five of water; this composition forms a soap which, when mixed with half its weight of good plaster of Paris, forms a strong cement which sets hard in three-quarters of an hour (Spon's workshop receipts). I may say that I have many lamps pass through my hands to set in their sockets and to set the tops on, and I never use anything but best fresh plaster and mix to the consistency of cream. I carefully clean all paraffin from the parts to be united, roughen the nib of the lamp with a fine file, and very, very seldom have one back again. I have two lamps in use that were set three years ago, and are as firm as ever, showing that if properly used there is no better and more convenient cement than plaster of Paris and water.—R. A.

Tinplate Patterns.—J. G. (*Tottenham*).—This correspondent asks to be informed of the easiest way of getting out patterns for tin and zinc plate working. If J. G. had specified the kind of pattern he required, I would have tried to accommodate him, but to fulfil his request I should have had to write a book. I think readers of WORK should exercise a little discretion, and remember that while information on points of practice will be willingly given, it is too much to ask questions that to answer would involve a descriptive account of a whole trade or profession. To give the best answer I can to you, however, let me say that patterns of most articles in general use will be described and illustrated in the pages of WORK in due course; also that if you will specify what you are really in want of I will do my best to give you advice as far as the limits of "Shop" will permit.—R. A.

Cast Shadows in Sign Writing.—G. E. D. (*Wallington, Oxon*), J. J. D. (*Bournemouth*), B. W., and E. G. H. (*Minehead*).—When drawing the letters which appeared in my article on "Sign Writing" (see page 713, Vol. I.) I was fully prepared to receive the strictures which others and yourself have made regarding the cast shadows. The fact is that no attempt at true perspective was made, but a purely conventional rendering of the same was followed. The cast shadows as shown in diagrams sent by yourself, B. W., J. J. D., and others, is in perfectly true perspective, and, as I have said, mine is a conventional rendering of the shadows only. I have already pointed out in my earlier chapters that true perspective should not be followed in sign-writing practice, and gave there my reason; at the same time, some sign writers put in the cast shadows as pointed out by you in your diagram, whilst others follow my method as shown in my letters. It is, in fact, a matter of taste and not a question of true perspective, nor a geometrical problem. Mr. W. Sutherland has defended this same subject long before to-day, and in one passage he says, "It is said in reference to picture painting that we should paint objects as we see them, and not as they really are. Neither the one nor the other of these propositions apply to letter painting, because we do not paint them either as we see them nor as they are, but as they best answer our purpose." The kind of shading shown in my letters gives to them force and distinctness, and answer every purpose, whilst in many cases, if the true laws of light and shade were followed, there would be great loss of beauty and symmetry of appearance. I do not say my readers are wrong—for they are right—neither do I say I have made a mistake, for I had carefully studied the question long ago. If my readers wish to go further into this matter I must refer them to the *Journal of Decorative Art* for February, 1883, where they will find the whole matter fully argued.—H. L. B.

Crystoleum Pictures. — H. C. (*Todmorden*) writes:—"In the first part of his instructive article on 'Crystoleum Painting' Mr. Beckerlegge mentions cornflour for mixing of paste. I have tried cornflour mixed with boiling water, the same boiled, and have mixed a little starch with it for the purpose of affixing photo pictures to glasses. Each attempt has been met with failure, for when the picture and paste get dry the water seems to have been absorbed into either the paper or glass, leaving the flour on the glass in streaks. Will Mr. B. be kind enough to give me instructions how to make the pictures stick to the glass, so that when dry they will be permanently held there?"—If H. C. will ask his mother or wife, if he has one, she will show him how to make starch. Cornflour is nothing but the finest of starch; this being so, what need is there to mix "starch" with it? To make the paste proceed as follows: Take a tablespoonful of cornflour and mix it with cold water—not hot; let it be perfectly free from lumps. Pour boiling water on it, stirring it the while. This flour will make about half a pint, more or less. If the boiling water has not turned it quite clear, it means that the starch cells have not all burst. Put it in a clean pan and gently boil it until it gets clear, when it will be properly cooked. Now what does H. C. mean by the water being absorbed either by the paper or glass? The water simply evaporates, and if the work is properly done the paper when dry can only

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be removed by scraping it away. I have some by me, done years before the article appeared, and the picture is as firm as enamel. The point of failure is, I suspect, here: the paste has not been properly squeezed from between the paper and glass. Until this is done the surface of the picture will appear in certain lights covered with minute silvery specks; these mean that there is not contact at these points between the two surfaces. If the picture gets dry before these are all removed, soak the picture for a few moments in warm water, and again proceed to work out the paste in the manner described in the article. Attention must be paid to the surface of the picture before applying the paste so that all grease is removed. If this is not done the picture will never stick to the glass. Has H. C. neglected this? Nothing has been discovered that will put the surface in better condition than licking with the tongue. Benzole or oxgall would do, but these are no better than the means referred to. If H. C. will look over the article again he will see that I have laid stress on these several points. If he will attend to these I am sure he will succeed. I shall, however, be pleased to answer any other question in "Shop."—O. B.

Name and Address Plates for Patented Article.—M. R. (*Glasgow*).—I should say what you require are small sheet brass plates, with your name and address stamped on from a die, and which are attached to the wooden article with two or three brass gimp tacks. If these will do, write to Mr. W. Tylar, 57, High Street, Aston, Birmingham, mentioning my name (H. L. Benwell), and he will probably supply you wholesale, or give you the address of someone in his town who executes this work. Enclose stamp for reply. These plates look neat and pretty, and may be attached to metal articles of all kinds with a little solder. I can also give you address of makers of ivory tablets.—H. L. B.

Tinsmiths' Machines.—STANNUM.—The American machines are no better in their working than our English make, and I do not think they are anything like so substantial in wear and tear. They are got up more to please the eye by appearances than for actual durability. The bar folders and paning-down machines are, as you observe, about equal. But Messrs. Rhodes & Son now make an improved paning-down machine with an adjustable table for holding the work up to the rollers whilst paning down; this, however, is more expensive than the ordinary form. I do not think there is much advantage in having a "hold down" attachment to guillotine shears when used for cutting sheet metal. It would be required, no doubt, for cloth or paper, but if it had been a necessity or even an advantage I think there is very little doubt that Messrs. Rhodes would have recognised the fact and adopted it in their machines. I think, myself, that with the machine in good order no "draw cuts" would be likely to occur. With regard to the combined paning-down and bottom-closing machine, I presume you refer to the Olmstead Leaner. This is a valuable machine for manufacturing purposes. It will set down and double seam the most difficult kind of work, light or loose bottoms, without the assistance of the hand up to XXXX stuff if the machine be properly set before commencing. It can be used for either round or oval, straight or flaring work, and though, as you say, different sized discs have to be used, it does not mean that you must use a different one for every sized article any more than you would in knocking up by hand use a different size mandrel or head, and the changing of a disc is a mere nothing. You ask the use of the deflector: it is to prevent the springing of the bottom after soldering. Space will not permit of further descriptions of this machine, but you can get a circular from Messrs. Rhodes, giving full particulars of its uses and directions for working. I can only repeat here what I have said before—that I have found Messrs. Rhodes most courteous to inquirers respecting their tools and machines; and if, as you say, you want to purchase machines, I am sure that if you state exactly what you require they will be very pleased to give you their advice and experience.—R. A.

Paper, Pigments, and Colours.—IRIS.—I hope the answer already given to £ S. D. will have proved worth waiting for. If you take so much interest in this and kindred subjects, why don't you master the "House-painting" series of papers? they were written for reference for all similar cases to yours. Respecting your second query, "Terra-cotta, No. 5," on Aspinall's card, is similar to ordinary oxide paint of a deep purple red tone. Three or four pounds of this dark oxide red, in paste, that is ground in oil, would do a goodly number of sashes. Care must be taken that all blisters are removed, and the sills watertight previous to painting. One coat of oxide, if properly used, would cover on any colour, but if the old paint is at all perished, you should give a previous coating of white lead paint, made to a lead colour by adding common black. If you give the sashes a final coat of "outside copal" varnish it will repay cost. If not varnishing, have the oxide mixed with driers and boiled oil with a little varnish to harden and help preserve the paint. Such colour as you indicate is very suitable, especially if you have vegetation about the house; otherwise, dark bronze green, made from green and black, or a little yellow added to black and varnished, is a good wearing treatment for sashes. Your doors, if not grained, might be in several shades of the sash colour. Panels, as sashes; styles, much darker by adding black; and the panel mouldings, black, with a very little red mixed in it, finished, of course, with a coat or two of outside copal varnish.—F. P.

Wedding-Ring Making and Polishing.—INDEX.—The inquirer asks, 1st, for method and tools to make wedding-ring; 2nd, mode of making buffs for polishing same. I will start with the presumption that you have your gold already in a strip, say one-third larger in section than your finished ring is to be. The shape in section that we desire in the finished article is as in Fig. 1, so our aim must be to get the gold as near that shape as possible. The best way is to make a swage—that is, a piece of iron or steel, with a groove cut across it the size and shape of the bolder side—then hammer the gold strip into it. If you have no swage, then get it this shape in section, *i.e.*, Fig. 2. with the corners knocked down, and from either of these conditions, proceed to draw it through a draw-plate, with holes the shape of Fig. 1. This is *not* half round, for that form is objectionable, on account of the sharp edge. In this draw-plate the gold is drawn smooth and true to the desired size either by the aid of a draw and bench, if stout, or, if

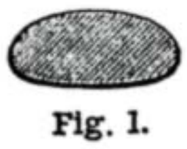

Fig. 1.

Fig. 2.

of small size, by gripping the plate in a firm vice, and pulling the wire through the holes with a pair of draw tags and by your own strength. If but one or two occasionally are to be made, then we can do without the draw-plate by paying much more attention to the form produced by the hammer, its regularity, its smoothness, etc., both before and after turning up into a ring. When the wire is the proper size, then cut it to the lengths required, and bend it up, if stout, by the aid of a bending block, ring-triblet, and mallet: if thin, then smooth pliers, or pliers protected with sheet-lead will suffice. After obtaining a good join, solder it with an alloy such as this:—1 dwt. of your 22-ct. gold, 2 grains of silver, 1 grain of copper. After soldering, get it clean in pickle (see page 649, Vol. I., of WORK), and then get it round on the ring-triblet with a wooden mallet. After that, fill it up if it is necessary, and then we can polish it. As to the emery and glue buffs you write about, I have noticed that our polishers do not use them, but prefer the tools and method as follows:—First remove all the file marks of both inside and outside with water of Ayr stone and water; secondly, obtain, or make, two buffs, one flat and one round, for the inside of the ring. These are only buff leather glued to sticks, either of round or flat wood as the case may be. With these, which are charged with powdered pumice-stone and oil, or crocus and oil, we get a nice smooth surface. Next clean the ring by washing in soda and water, or anneal it. Then gild or colour, and finish by burnishing with a steel or stone burnisher, lubricated with soap and water. These are but the steps and names of tools and material, which will probably suffice, as you are a watchmaker. If the description is not clear enough, write again for the particular details you want to know, and I'll do my best to explain more fully.—H. S. G.

Telephone Communication.—E. P. B. (*Penge*).—I am very sorry that I cannot answer your questions fully in this column, for the simple reason that it would occupy too much space. I will, however, try and set you right in a few points. You ask, "Can a microphone be used to intensify transmittal of speech?" In a telephone circuit the microphone is the transmitter of speech, or any sound, for that matter, made in its vicinity. The intensity of the sound, in ordinary circumstances, is more directly dependent upon the receiver. Generally speaking, the sound made at the

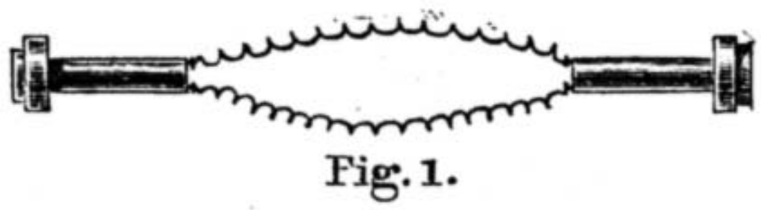

Fig. 1.

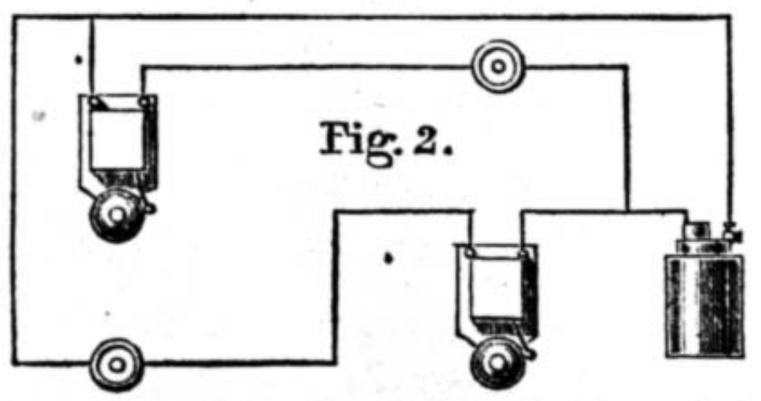

Fig. 2.

Fig. 1.—Telephone Circuit—Two Receivers to be used alternately for Speaking and Hearing. Fig. 2.—Bell Circuit, showing Method of connecting up for Reply, using one Battery only.

transmitter is loud enough, but the receiver sometimes has a very bad fashion of whispering so low that it is almost impossible to hear it. Hence we have loud-speaking telephones—*i.e.*, receivers which speak out well the words spoken at the other end. I have already given sketches of connections between the various parts of a telephone circuit in WORK, which you should look up and apply to your own instruments. Receivers are not generally used to speak into, as you seem to think, in telephonic systems; in fact, the term implies the very opposite. In the meantime, I would advise you, if you intend to set up communication between two rooms in your house, to make two receivers like those figured and described in WORK, and join them together, as Fig. 1, and use them alternately as transmitter and receiver. For the circuit you must use covered copper wire. If the receivers are well made they should speak well enough for your purpose. You could run another wire between two bells for calling attention alongside your telephone wire. In the bell circuit you must have a battery and two pushes (see Fig. 2). This is the best I can do for you; in the meantime, see replies to other queries about switch board, etc. I cannot tell you the best tool to bore telephone cases in the lathe, but I think the method described in the article is simple enough, and suits the purpose.—W. D.

Paints and Varnish for Tin Ticket Writing.—A. S. G. (*Hull*).—Write to Messrs. Brodie and Middleton, oil and colourmen, Long Acre, London. The tin tablets you refer to are mostly printed in enamel by special machinery and then stoved. If you refer to such as grocers use to place on their goods, a mixture of paint and varnish is used, and Messrs. Brodie and Middleton will supply with the suitables for your purpose both in colours, varnishes, and brushes.—H. L. B.

Sketch of Initials.—F. J. (*Preston*).—If you refer to any ornamental copy book, which can be bought for 2d., you will find the letters you require in various styles. Copy those. Possibly you will be able to work them into a monogram.

Steam Launch.—Will B. F. (*Birkenhead*) kindly send his full name and address to the Editor of WORK?

Scene Painting.—REGULAR READER (*Dalston Lane*).—Doubtless some papers on "Scene Painting" and other stage matters will be given if it is found that there is sufficient demand for them. Write to S. French, 89, Strand, for 6d. handbook on the art.

Gilding on Glass and Embossing.—A PAINTER.—It would occupy two or three pages of WORK to give even the simplest instructions in this art, so in these columns it is impossible. Doubtless some practical and illustrated papers on the art will be supplied when the Editor can find room for them.—H. L. B.

New Buckle.—F. H. A. (*Ajmere, India*).—The notice of your buckle duly appeared in No. 49 of WORK.

Firewood Manufacturing.—ANXIOUS.—There is an excellent machine for bundling firewood, which has already been noticed in WORK—the Excelsior bundler, Glover & Co., Potterdale, Leeds; but a simple contrivance of rope and lever is often used, and while the lever is strained over the bundle the string is tied by hand. The machine tiers, I believe, use wire. This is not quite the place to fix the workman's wages, but it ought to depend on the sort of appliances provided by the employer.—B. A. B.

Chucks.—T. D. (*Keighley*).—The chucks used on the self-fitting joiner's braces are composed of the jaws, and the male and female screws which contain them. New jaws can be had to fit joiner's braces at any good tool shop for 1s., and the complete chuck is made in varied sizes and prices, and I have bought an excellent one at Melhuish's, Fetter Lane (who advertise in WORK), for a small sum. I expect you will have to get it in the form of a universal tool handle. Circular saws of the same firm, or of dealers in metal goods and tools for jewellers, as the size given is very small.—B. A. B.

Trade Usages.—INQUIRER.—I know of no book that will give you any information on the above. There was a good old custom of allowing the men a certain amount of time during the morning for lunch. I have made inquiries amongst men who have been in the trade a long time, but, as far as I can make out, the usages generally took the shape of "horse play;" for instance, if an apprentice left his saw standing in an unfinished saw cut, and it was noticed, he would most likely find the handle covered with dirty oil, paint, glue, or any other substance that the practical joker might find handy. Of course I have from time to time heard of a good many old-fashioned usages, but as I could not vouch for their veracity, I do not feel justified in quoting them. But if I hear of anything that I think might interest you I will let you know forthwith.—E. D.

Composition for Panels.—WAITING.—Your first note was duly answered in "Shop," shortly after your second note was received. I do not think your first question corresponded with the one now under notice. In reply to the latter I do not know of any substance you are likely to succeed in "moulding upon paper or cardboard in imitation of lincrusta," unless it be gesso, of which I cannot personally speak. The articles which appeared in Vol. I. on this kind of work will doubtless give you all the information thereon you require. You are not likely to succeed with what you mention. I think you are occupying yourself with anything but a commendable notion, and will find you may spend much time and trouble, and get nothing worth preserving. Surely there is a better direction for your personal tastes and energies than in

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making or attempting poor imitations of a *machine*-made article.—F. P.

Violin Rib Bending. — CATGUT. — The only useful instruction which I can give you through "Shop" is that you must clean up the rib strips, and afterwards bend them to the required shape over hot irons; the details of the process will be described in the proper place.—B.

Lamp Burner.—READER FROM THE START.—In view of the present controversy I should be sorry to say definitely which is the best lamp burner, but I presume you only require a burner to fit a lamp fount you already have. In that case I shall have no hesitation in recommending Hinks' No. 1 patent safety duplex burner, which, in my opinion, far surpasses those of any other make, that can be fixed to an ordinary fount. It has a bar fitted across the bottom, to put a suction wick in, which facilitates the oil being drawn up to the two wicks that are lit; the extinguisher is also very good. The price, I believe, is 6s. 6d. or 7s.—T. W.

Developing Dry Plates.—C. W. (*North Tawton*).—(1) Keep the plate well covered with developing solution, and moving it about during the time it is in contact with the film. (2) Yes; after the development is well advanced, not before—the less the better; wash the developer off before holding it up to the light, or marks of irregular development may be caused. (3) It is a good developer, but with some plates carbonate of soda is better than ammonia. Do not hurry the development, give plenty of time, and expose to the light as little as possible during the operation.—D.

Umbrella Sign.—W. J. B. (*Bermondsey, S.E.*).—If you wish for an enlarged drawing of the small umbrella engraving you send, you must get a draughtsman to make it for you, as such things are not sold, there being no possible use for them.—H. L. B.

Sign-Writing Book.—J. R. B. (*London, S.E.*), AN ADMIRER OF "WORK," and A. R. (*Saltaire*).—"The Art and Craft of Sign Writing," price one guinea, *The Decorative Art Journal* Publishing Co., 15, St. Ann Street, Manchester. The publishers notify that there are but very few copies of the work left, which cannot be reprinted.—H. L. B.

Mounting Drawings.—G. B. (*Accrington*).—Your inquiry is somewhat disjointed: first, you inquire about picture *framing*, then your query resolves itself into how to mount *pictures*. I suppose you mean drawings, lithographs, etc.—in fact, productions whose base is paper; it is as well to inform you that in the trade we understand *pictures* to mean paintings on canvas, *drawings* to be (as I before said) anything sketched on paper. Now to mount your paper drawing, first lay down with drawing pins on a bench or board a piece of 6-sheet common mounting board, which you can obtain at any stationer's; then take your drawing, and with a clean sponge damp the back—I say damp, I mean do not drench it; the effect will be that in a few minutes the paper will expand; you then paste (still at the back of drawing) about ¾ in. all round (not all over), then lay it down on the mounting board, just carefully pressing with a silk handkerchief all round the edges; the next thing to do is just allow it to dry very gradually; do not hurry it; you will then find it strain as tight as a drum-head. To make a more finished effect, you can now cut an opening in an 8-sheet white board, just sufficient to show the drawing; the edges of the opening should be cut on the bevel; this you should glue with thin glue; place over your drawing, and put in a press or under a weight till quite dry.—F. B.

Copper Analysis.—F. N. (*Smethwick*).—Native copper—that is, pure copper—is found in veins disseminated in granite in Cornwall and North Wales; but the most abundant English ore of copper is copper pyrites or yellow copper ore, which is a double sulphide containing copper, iron, and sulphur, and is generally associated with arsenical iron pyrites, tin-stone, quartz, fluor-spar, and clay. A purer variety of pyrites is peacock ore, or variegated copper ore, which is found at St. Austell and Killarney. Another abundant ore is grey copper ore, which is a compound of the sulphides of copper and iron with those of antimony and arsenic; but it often contains lead, zinc, and sufficient silver to render the extraction of the latter a matter of great importance. Another important Cornish ore is copper glance, a chemical compound of copper and sulphur, which is generally free from other metals. Red copper ore differs from the preceding ores in being free from sulphur, consisting of copper and oxygen; and green malachite, which is, however, not abundant in England, is a basic carbonate of copper. These are all English ores, but we also import copper sand, a mixture of metallic copper and quartz; and indigo copper, so named from its dark blue colour, from Chili; and also blue malachite from Australia. The following table will show you the proportion of copper in the above:—

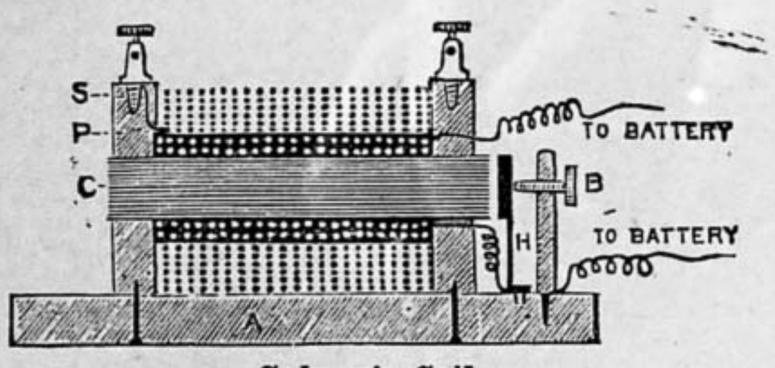
Ore.	*Composition.*	*Copper in 100 parts of pure ore.*
Red copper ore	copper, oxygen ...	... 89
Copper glance	copper, sulphur ...	... 80
Indigo copper	copper, sulphur ...	... 97
Copper pyrites	copper, iron, sulphur	32 to 35
Peacock ore	copper, iron, sulphur	... 56
Grey copper ore	copper, iron, sulphur, antimony, arsenic	25 to 40
Green malachite	copper, oxygen, carbonic acid, water	... 58
Blue malachite	copper, oxygen, carbonic acid, water	... 56

F. B. C.

Induction Coils.—W. D. (*Belfast*).—"Intensity Coils: How Made and Used," by Dyer, is published by Perken, Son & Rayment, 99, Hatton Garden, London, and is sold by all booksellers and opticians at 1s. Order it from a bookseller. It is a thin book, only weighing 4 oz., so could be sent by post for 1d. extra.—G. E. B.

Model Dynamo. — AN INQUIRER. — Most certainly there must be a definite proportion between the various parts of a model dynamo. The weight of iron in the field magnets should be from seven to eight times the weight of that in the armature. The wire on the field magnet cores of a shunt wound machine must be longer and finer than that on the armature: the resistance of the first being in the proportion of 400 to 1 of the latter. In a series wound machine, the resistance of the wire on the field magnets should be two-thirds that on the armature. Small machines must be worked rapidly to get any useful effect. Get Mr. Bottone's little book on "The Dynamo: How Made and Used." It is a good book for learners such as yourself.—G. E. B.

Galvanic Coil. — IKY MO. —Make the core of your coil out of a bundle of fine iron binding wire soaked in paraffin wax. This goes inside a paper tube forming the body of the bobbin. On this, wind two layers of No. 18 silk covered copper wire to form the primary wire. Wrap a fold of silk ribbon round this, and then fill up the bobbin with No. 36 silk covered copper wire wound on evenly as a reel of cotton is wound. Attach one end of the primary wire to the foot of brake spring, as shown in sketch. The other end



Galvanic Coil.

of this wire goes direct to the battery. A wire from the battery goes to the foot of the brake pillar, as shown. The two ends of the secondary wire are attached to the feet of binding screws fixed in the bobbin ends. The secondary wire is not fastened to the primary. Your coil when thus wound will not be a very powerful one, but should give smart shocks. Get Dyer's book on Coils (price 1s.) if you cannot await my articles on this subject.—G. E. B.

Electro-Motor for Lathe. — R. N. (*Grays*).—Space cannot be spared in "Shop" for detailed instructions and necessary illustrations showing how to make an electro-motor. To make an electro-motor capable of driving your 3½-in centre lathe, I should advise you to get a set of castings of the "Simplex" pattern, to the following dimensions:—core, 4½ in. by 8 in.; armature of cogged and laminated plates, 6 in. in diameter and 2in. in length. The core should be wound with 20 lbs. of No. 20 double cotton-covered copper wire, and the armature with 4 lbs. No. 16 double cotton-covered copper wire.—G. E. B.

Electro-Magnet. — G. W. (*Folkestone*).—It is not necessary to get a larger magnet to pull 4 oz. at a distance of ½ in. The bell magnet of a 2½ in. bell will do the work if you put on enough battery power. It is weak because your battery power is weak. Increase the number of cells in series, and then you will probably get the power that you require. If your cells are small, and the magnet is not improved by adding to their number, unwind the wire on the magnets and wind on a wire one or two gauges finer, so as to get more turns of wire on the bobbins. To get the full power out of a piece of iron, it should be wound with wire to within three times its diameter. Then the magnetic power developed will be equal to the ampères of current sent through the coil multiplied by the number of convolutions of wire wound on the core. 5,000 ampères will fully magnetise 1 cubic inch of iron, and this should then hold up 120 lbs.—G. E. B.

Book on Scales and Weights. — F. A. C. (*Appledore*).—Get "Oldberg's Manual of Weights, Measures, etc.," 9s., Trübner & Co., Ludgate Hill, London.

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—W. G. M. (*Bow, E.*); J. W. H. (*Bradford*); W. J. L. (*Deptford*); W. M. (*London, W.*); UT PROSIUM; J. S. (*North Shields*); HANDY; A DELUDED INVENTOR; J. L. (*Peckham*); J. L. D. (*Ballytrophy*); D. B. (*Glasgow*); T. C. (*Aberdeen*); W. H. H. (*Huddersfield*); P. W. (*Ashton-under-Lyne*); W. J. M. (*Hampstead*); MIEUX QUE QA; J. W. (*Middleton*); J. W., (*Stoke-on-Trent*); H. E. (*Clapham*); NED (*Tynemouth*); PRACTICAL; W. D. V. (*Abingdon*); W. W. P. (*Glasgow*); A. E. W. (*Birmingham*); H. W. (*Caton*); F. C. J. (*Masboro*); T. F. (*Wellington-on-Tyne*); MONUMENT; T. E. C. (*Liverpool*); SQUARE CENTRE; I. J. W. (*Merthyr Tydvil*); H. M. (*West Ham*); T. R. B. (*Newcastle-on-Tyne*); J. F. (*Glasgow*); W. H. E. (*Kensal Green*); A. P. (*Frome*); W. B. (*Preston*); J. H. (*Leeds*); C. E. W. (*Birkenhead*); W. J. T. (*Swansea*); W. H. (*Bristol*); J. K. (*Islington*); W. H. H. (*Chancery Lane*); R. A. (*Islington*); J. W. (*Middletown*); W. M. B. (*Reading*); F. S. (*Northumberland*); G. T. (*Plymouth*); G. E. S. (*Berkeley*); AMATEUR; F. T. R. (*Cardiff*); W. H. C. (*Tipton*); G. B. W. (*Hammersmith.*)

"WORK" EXHIBITION
(1890-91).

IMPORTANT PRIZE COMPETITION IN CONNECTION WITH THE ABOVE-NAMED EXHIBITION.

The Publishers of WORK have much pleasure in offering the following Prizes for Designs for the Medal and Certificate of Merit, to be awarded to Successful Exhibitors in the various Groups and Classes as set forth in page 290 (No. 70) of this Magazine:—

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FIRST PRIZE	Two Guineas.
SECOND PRIZE . . .	One Guinea.
THIRD PRIZE	Half-a-Guinea.

For Design for Certificate.

FIRST PRIZE	Two Guineas.
SECOND PRIZE . . .	One Guinea.
THIRD PRIZE	Half-a-Guinea.

If any Competitors wish to submit a Model in Clay, Plaster, Wax, etc., as a Design for Medal instead of a Drawing, they are at liberty to do so.

Competitors should send in Drawings or Models not later than September 30, 1890, addressed, carriage (or postage) paid, to

MESSRS. CASSELL & COMPANY, LIMITED,
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Prize Competition. Medal (or Certificate, as the case may be.)

A Motto must be affixed to each Drawing, and the name and address of the sender enclosed in a sealed envelope bearing *the same motto*, which must be transmitted by post, under cover, to the Editor of WORK.

The Drawings sent in Competition will be submitted to three competent judges, who will select those that are considered most worthy of prizes.

The Prize Drawings will become the property of Messrs. CASSELL & COMPANY, Limited, who will return all Designs made by unsuccessful competitors to their respective owners carriage paid.

The Awards, with the names and addresses of the successful competitors, will be announced in WORK in due course.

For further particulars, all intending competitors should apply to the Secretary, "WORK" Exhibition, CASSELL & COMPANY, Limited, as above.

Trade Note.

THE second competition for Carving and Art Wood Work, held by the Worshipful Company of Carpenters in their hall in London Wall, has just taken place, and it is satisfactory to learn that in the number of exhibits, but more particularly in the quality of the work shown, there was a marked improvement on that of last year. Money prizes to the amount of nearly £60 were awarded besides Medals, and the Company have every reason to hope that with these Competitions and the School of Wood Carving they have established at Chapel Street, Bedford Row, a fresh impetus will be given to the Art of Wood Carving in this country. The next competition will be held in June, 1891, and the syllabus of same will be duly given to readers of WORK.

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Tools, Tools, Tools.—The cheapest house in the trade for English and American tools is LUNT'S, 297, Hackney Road, London, E. Send stamp for reduced price list. [6 R

Fretwork, Carving and Repoussé Work.—Catalogue of all requisites, 700 illustrations, 6d. each—HARGER BROS., Settle, Yorks. [13 R

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10/6 Stanley Complete Outfit. 10/6

Including Polished Mahogany Camera, with Folding Tailboard, Brass Side Bar, and Double Dark Slide in hardwood box, with leather strap, in all other respects the same as Eclipse Complete Outfit; by Parcel Post, 1s. extra. Better Outfits from 21s. up to £100. See Catalogue.

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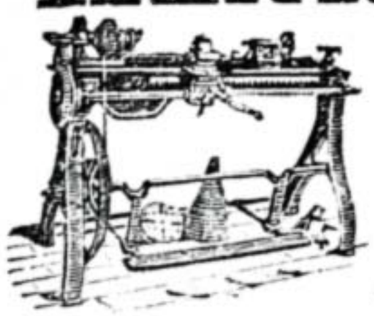

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